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ABSTRACT

This dissertation surveys, analyzes and reports the comparison of direct departmental costs associated with the technical core curriculum of emergency medical technology programs at nine public two-year community colleges for the academic years of 1989-90, 1990-91, and 1991-92. Data were collected using The Emergency Medical Training Technology Program Cost Questionnaire. In addition, data from examination results on the National Registry of Emergency Medical Technicians (EMT)-Advanced Level were analyzed. The data were analyzed and compared using descriptive statistics and correlation procedures. Results suggest that the cost per student contact hour of instruction was correlated with the number of laboratory hours, number of affiliated clinical instruction sites, number of faculty members, faculty salaries, the age of the program, and attrition rates, but was not correlated with total enrollment, number of didactic and clinical hours of instruction, or expenditures for equipment. The first time pass rates on the National Registry of EMTs' Advanced Level examination were not correlated with the number of didactic or laboratory hours of instruction, but were correlated with the number of clinical instructional hours, the number of faculty and faculty salaries. It is recommended that emergency medical technology program staff become more knowledgeable regarding factors associated with program costs. Suggestions for future research are discussed. Contains 63 references. (SKF)

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ED 430 625

A Dissertation

entitled

The Departmental Technical Curriculum Instructional Costs of Emergency Medical Technician-Paramedic Programs in Two-Year Public Colleges in the United States

by

Judith A. Ruple

as partial fulfillment of the requirements for
the Doctor of Philosophy Degree
in Education

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An Abstract of

THE DEPARTMENTAL TECHNICAL CURRICULUM INSTRUCTIONAL COSTS OF EMERGENCY MEDICAL TECHNICIAN-PARAMEDIC PROGRAMS IN TWO-YEAR PUBLIC COLLEGES IN THE UNITED STATES

Judith A. Ruple

Submitted in partial fulfillment
of the requirements for the
Doctor of Philosophy Degree
in Education

The University of Toledo

December 1993

The purpose of this study was to survey, analyze and report a comparison of the direct departmental costs associated with the technical core curriculum of nine emergency medical technology programs in public two-year community for the academic years 1989-90, 1990-91, and 1991-92. The nine emergency medical technology programs were accredited by CAHEA and were located in states that required successful completion of the National Registry of Emergency Medical Technicians-Advanced Level examination prior to certification as an Emergency Medical Technician-Paramedic.

The Emergency Medical Technology Program Cost Questionnaire was used for data collection. The National Registry of Emergency Medical Technicians provided the examination results for individual programs.

3

Descriptive statistical analysis and the Pearson product-moment correlation procedures were used for data interpretation.

Costs per student contact hour of instruction ranged from $38.12 to $345.08. The total head count enrollment, number of didactic and clinical hours of instruction and expenditures for equipment were not correlated with the cost per hour of instruction.

Costs per student contact hour of instruction were correlated with the number of laboratory hours, number of affiliated clinical instruction sites the number of faculty members and faculty salaries, the age of the program and attrition rates.

The first time pass rate on the National Registry of EMTs' Advanced Level examination was not correlated with the number of didactic or laboratory hours of instruction. The pass rate was correlated with the number of clinical instructional hours, the number of faculty and faculty salaries.

It is recommended that emergency medical technology program directors and educators become more knowledgeable regarding factors [illegible] program costs. A national study to review the technical core curriculum hours of instruction, the number of faculty positions, and the total expenditures for faculty salaries is recommended.

Future studies are recommended to investigate the effect of CAHEA accreditation status on emergency medical technology programs. The effect a national credentialing examination produces on curriculum design, faculty staffing patterns and the clinical education of students should be studied.

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CHAPTER 1

INTRODUCTION

The development of a new allied health professional, the Emergency Medical Technician-Paramedic (EMT-P), was an outgrowth of the Emergency Medical Services Act of 1966; subsequently, educational programs proliferated to meet the need for professionals to function as EMT-Ps. Specific criteria for accreditation of EMT-P educational programs have been developed both at the state and national level. The American Medical Association Committee on Allied Health Education and Accreditation (CAHEA) established accreditation standards for Advanced Emergency Medical Technician (EMT) educational programs in 1978. Sixty-seven CAHEA accredited programs were in existence and over 4,000 students had completed the required education for certification as EMT-Ps by 1990 (JAMA, 1991). Educational requirements for EMT-Ps expanded rapidly as curriculum content changed to reflect medical technology current at the time. This resulted in an increase in the complexity and content of the EMT-P curriculum over the last two decades. The addition of more academically sound content in allied health educational programs resulted as programs moved from "on-the-job-training" in community hospitals to universities and community colleges (Harper, 1977).

A community benefits from having access to the services of skilled emergency medical technician-paramedics (EMT-P) capable of providing emergency medical interventions outside the traditional hospital setting (Bergner, 1983; Cummins, 1984;

Cummins, 1989; Eisenberg, et al 1989; Eisenberg, et al, 1990; Weaver, 1986). Costs associated with maintaining and staffing an Emergency Medical Service increased sharply as programs proliferated (Kersley, 1989). A shortage of personnel to staff emergency medical services was a problem in some states (Blayney, 1989). These shortages helped to drive the costs of prehospital emergency medical care upward. High turnover rates among EMS personnel have existed due to the inherent stress of prehospital emergency medical care (The Occupational Outlook Handbook, 1991). This also contributed to higher costs in the profession.

Statement of the Problem

Cost increases associated with providing educational programs to prepare EMT-Ps may restrict the future availability of emergency medical health care nationally (United States Bureau of Labor Statistics, 1991). The soaring cost of health care in the United States has created a demand for accountability in the allocation and delivery of medical services and resources by the public (Goldfarb, 1991). Expensive components of the health care system, such as emergency medical services, have been increasingly required to justify their costs. A significant contributor to the cost of health care services has been the cost of medical, nursing, and allied health care educational programs (Fiesta, 1992; Halonen, 1976; Hammersberg, 1982; Smith, 1975).

Large scale cost studies of health professions, in particular those of medicine and nursing, have been undertaken and funded by professional organizations as well as the federal government. Studies have also been conducted, that examined the costs associated with nursing and allied health educational programs (U.S. Department of Health and Human Services, 1986, Bowen, 1980; Brown, 1980; and Harper, 1973). The costs of developing and maintaining the technical curriculum of emergency medical technician-paramedic programs have not been studied. A national survey revealed that directors of state emergency medical services agencies in 24 states were unable to provide an average cost for emergency medical technician-paramedic educational programs (Ornato, 1988).

A trend toward closure and consolidation of health care facilities enhanced the importance of emergency medical systems. Stabilization of patients prior to extended transportation time has gained acceptance as an important influence on survival rates of critically ill or injured persons (Patton, 1989). However, research was needed to identify the essential elements of a successful EMS system (Patton, 1989). The education of EMS providers was an essential element for the provision of prehospital emergency medical care.

The Education Commission of the States (1980) recognized that the recurring theme for postsecondary education in the 1980s would be that:

> "the squeeze of inflation and limited resources will have a major impact on all the areas of coordination and governance, from planning to program review of new and existing programs to finance and budget."

Senior administrators at 444 universities, colleges and community colleges were asked in 1990 what constituted the major challenges facing postsecondary educational institutions in the next five years. Sixty-two percent of the community college administrators in this study identified procurement of "adequate finances" as the biggest challenge they would face in the next five years (The Almanac of Higher Education, 1991, p. 70).

Criticisms of the value of higher education have emphasized the need for assessment and accountability within the academic setting (Leslie, 1988). Concern for quality and efficiency in the management of higher education occurred at a time of declining enrollments and funds (Jones, 1984). Terenzini (1989) observed, "Now that the costs of a college education are identifiable and measurable, important people (for example, legislators, parents, students) now want to know what the return is on the investment." (p. 645) An environment of competition among and within institutions for students and funds has resulted. Administrators in higher education have a serious interest in the impact of educational program costs on their institutions (Bowen, 1972; Fraser, 1978; Gonyea, 1978).

None of the literature or cost studies, nor any information available in the national office of CAHEA, provided any data on direct departmental costs associated with the technical curriculum of EMT-P education in accredited two-year colleges. A significant program planning problem existed because of the lack of information on this matter.

A determination of the expense of providing the technical curriculum of educational programs to educate EMS personnel may be helpful in identifying historical and future trends in financing patterns. Patterns of financing EMS services can only be determined after identification of the costs associated with essential elements of the service.

Purposes of the study

The purposes of the study were two-fold. The first was to survey, analyze, and report direct departmental costs associated with the development of the technical curriculum of EMT-P educational programs in 12 associate degree emergency medical technology programs offered by public two-year community colleges in the United States, that graduated students in the 1991-1992 academic year. The 12 associate degree medical technology programs were accredited by the Joint Review Committee for Educational

Programs for Emergency Medical Technician-Paramedic (JRC/EMT-P), a subcommittee of the Committee on Allied Health Education and Accreditation (CAHEA). The 12 programs were located in states that required successful completion of the National Registry of the Emergency Medical Technicians (NREMT) Advanced Level written and practical examinations as a prerequisite to state certification as an EMT-P. The second purpose was to analyze the direct departmental costs associated with the technical curriculum of the selected EMT-P educational programs for the academic years 1989-90, 1990-91, and 1991-92 in relation to didactic, clinical, laboratory, and field internship contact hours.

The technical curriculum was the course work within the two-year associate degree plan of study that prepared a student to function as an EMT-P. It was comprised of the United States Department of Transportation National Standard Training Curriculum-Paramedic (USDOT-NSTC-P, 1985). The study identified the direct departmental costs of the instructional components of the technical curriculum and developed a model based on previous research for analyzing the cost per contact hour of the technical curriculum of EMT-P educational programs.

Information gained from the study may assist administrators in estimating the direct departmental contact hour costs for the establishment of EMT-P educational programs. The study may provide existing EMT-P educational programs with a method for estimating direct departmental costs associated with a program's expansion, revision, or continuation.

Emergency medical technology program directors have based administrative decisions on experience or relied on information regarding costs of other allied health education programs. This information has not been based on systematic cost studies of emergency medical technology programs. Information regarding the costs of specific educational programs should prove useful for administrators and others involved in resource allocation.

Organization of The Study

This study of the departmental technical curriculum instructional costs of emergency medical technician-paramedic programs in selected two-year public colleges in the United States is organized as follows:

Chapter 1 includes the history of emergency medical services and the development of emergency medical technology programs in the United States and describes the lack of cost studies available to administrators and educators involved in planning emergency medical education programs, the purpose and plan of the study, the definitions of key terms, the limitations, and the significance of the study.

Chapter 2 includes the review of the literature pertaining to the history and development of emergency medical services and emergency medical technology education programs, cost factors related to health technology education, and the efficiency of EMT-P education programs.

Chapter 3 includes the general design of the study, the research questions to be answered, the method of selecting the population, the specific methods of data collection, and the techniques used to interpret the data, the limitations, and the significance of the study.

Chapter 4 contains the data collected from each emergency medical technician-paramedic program and describes the differences among the programs' cost measurements.

Chapter 5 contains the study summary, conclusions, and recommendations.

CHAPTER 2

LITERATURE REVIEW

This chapter includes a review of the literature in three sections: (1) The historical background of the development of Emergency Medical Services after the Emergency Medical Services Act of 1973, (2) Literature relating to the role and responsibilities of EMT-Ps and the design of EMT-P educational programs, and (3) the efficiency of educational programs in general and the efficiency of EMT-P programs specifically.

Historical Review of Emergency Medical Services

The origin of emergency care for the sick and injured dates back at least to the Crusades. The Crusaders established the Venerable Order of St. John of Jerusalem, a special order of knights dedicated to helping wounded soldiers (Cales, 1986). Credit for the first organized system of battlefield retrieval and treatment goes to Baron Dominique Larrey, Napoleon's chief surgeon. Baron Larrey designed a horse-drawn carriage for the wounded referred to as - "ambulance volante" (Cales, 1986). During the Franco-Prussian war of 1870, hot-air balloons were used to evacuate injured soldiers from the battlefront (Cales, 1986).

The U.S. Department of Health Education and Welfare (HEW) established the Division of Accident Prevention in 1963. In 1966, the nation's attention focused on the National Research Council's report, "Accidental Death and Disability: The Neglected

Disease of Modern Society." This major governmental report informed the public of the number of people killed or disabled by accidents and the subsequent billions of dollars such accidents cost the American people (McKay, 1985). The report identified deficiencies in all levels of emergency care and made specific recommendations for a national effort to improve the emergency medical system.

The federal government, responding to the National Research Council's report, spearheaded the development of modern prehospital emergency medical care. The U.S. Department of Transportation began funding improvements in the emergency medical service following the passage of the Highway Safety Act of 1966. The Emergency Medical Services Systems (EMSS) Act (1993), defined what a modern emergency medical service system should be and established the Division of Emergency Medical Services as the lead agency to coordinate a comprehensive national program for EMS development (McKay, 1986). Guidelines for education and provision of major funding for training, equipment, and development of regional emergency medical systems resulted from federal initiatives. Emphasis was given to regionalization, medical control, facility categorization, treatment protocols, and long-term financial stability (United States Department of Health, Education and Welfare, 1979).

Systems for the delivery of emergency medical services were being developed and tested internationally in the 1960s. Dr. Frank Partridge, in Belfast, Ireland, in the mid 1960s experimented with using physicians in mobile coronary care units to treat patients with heart problems before they were admitted to a hospital (Griffiths, 1989). This innovative emergency care program increased the survival rates of heart attack victims (Griffiths, 1989). Physicians in other European countries developed programs that provided similar pre-hospital emergency care, following publication of Partridges' findings.

Previous to the understanding of the importance of prehospital care, emergency care in the United States was left to well-intentioned ambulance drivers or funeral directors, who had little or no training in the treatment of medical emergencies (Post, 1992). Dr. Eugene Nagel is credited with starting the first paramedic program in the United States in the mid 1960s. Dr. Nagel trained the city of Miami, Florida's fire fighters as, "physician extenders," to provide emergency medical service to a large metropolitan area (Griffiths, 1989). Emergency medical services (EMS) have become the modern way of obtaining help for a victim of a sudden illness or traumatic injury. Media representation of the emergency medical technician has popularized the service and the development of 911 phone systems has increased access to the service (Morhaim, 1989). Moreover, it is accepted, generally, that the care a patient receives in the first few minutes of a sudden illness or traumatic injury has a significant effect on the final outcome (Eisenberg, 1984; Stults, 1986; Weaver, 1986). The public no longer expects to place an ill or injured person in an automobile and drive to the hospital for emergency medical care.

The Role and Educational Preparation of EMT-Ps

A new Allied Health profession resulted as an outgrowth of The Emergency Medical Services Act of 1973; the EMT-P. Educational programs to meet the need for professionals to function as EMT-Ps have proliferated since that time. There has been a general increase over the last two decades in the complexity and content of the EMT-P curriculum (National EMS Clearinghouse, 1989). Specific essentials for the accreditation of EMT-P educational programs have been developed, both at the state and national level.

The U.S. Department of Transportation (USDOT) introduced the basic training curriculum for emergency medical technicians-ambulance in 1969. This curriculum, more comprehensive than traditional first aid courses, concentrated on training ambulance personnel. The advanced curriculum for emergency medical technicians-paramedic (USDOT-NSTC-P) was introduced by the USDOT in 1971. The American Medical Association Committee on Health Manpower, acting on a recommendation received from the AMA Council on Health Manpower and its Committee on Emergency Health Occupations, voted to develop standards for the accreditation of educational programs for Advanced Emergency Medical Technicians (EMTs), in 1975. The emergency medical technician was, as a result, acknowledged by the AMA, in 1975, as a legitimate emerging health occupation. The AMA's Council on Medical Education adopted the Essentials for Accreditation of Educational Programs for Emergency Medical Technician-Paramedic in 1978 ("Allied Health, 1978"). In 1982, nine emergency medical technician educational programs received accreditation from the Joint Review Committee for Educational Programs, the Emergency Medical Technician-Paramedic (JRCEPEMT-P), a subcommittee of the Committee on Allied Health Education and Accreditation (CAHEA). By 1988, 58 programs had received accreditation with 23 new programs achieving accreditation in the 1987-1988 academic year. As of 1992, 76 emergency medical technician-paramedic educational programs in hospitals, community and technical colleges, universities, and private organizations have met the CAHEA standards for accreditation (CAHEA, 1992).

The number of educational programs for EMTs grew rapidly in the late seventies and early eighties. They were funded by federal appropriations for the development of a national emergency medical system. The federal government had funded more than 300 regional projects by 1974. These projects trained emergency medical technicians, purchased improved equipment, and defined the structure of emergency medical services (Page, 1989). The USDOT-NSTC-P was revised and expanded in 1985 to reflect the need to prepare students to function at increased levels of technical sophistication. Four to five hundred programs for the education of EMT-Ps existed in 1988 (Occupational Outlook Handbook, 1991).

Emergency medical technicians have performed procedures designed to maintain the patient's airway, breathing, circulation, and the control of bleeding. Emergency medical technicians with advanced training have also provided the sophisticated emergency treatments of controlling life-threatening cardiac arrhythmia and administering drug therapy. These were procedures the patient would not have received until arrival at the hospital emergency department if emergency medical services had not been available (Griffiths, 1989).

Students, as part of an emergency medical technology program, studied anatomy and physiology as well as pathophysiology of various injuries and diseases in a classroom setting. Students learned advanced methods of managing emergency patients, including endotracheal intubation, the intravenous administration of medications, cardiac monitoring, and defibrillation. These procedures were also learned in a clinical setting.

These findings from the 1989 National EMS Clearinghouse report on training and certification of EMS personnel continue to reflect the present experience of these programs.

Three recognized levels of prehospital care providers were available in 1992. They were EMT-A, EMT-I, and EMT-P, all with varying degrees of education and all members of the emergency medical service team. All levels of emergency medical technician training followed the minimum guidelines established by the U.S. Department of Transportation (USDOT) and were regulated and certified at the state level (McKay, 1986).

The National Registry of Emergency Medical Technicians (NREMT-P) was the national body that administered certifying examinations for all three levels of emergency medical technicians. The NREMT-P written examination was a criterion-referenced examination. Numerous credentialing boards began adopting a criterion-referenced standard setting in the 1970s. Use of criterion-referencing was also a requirement for membership in the National Commission for Health Certifying Agencies (NCHCA), an organization that has set standards for evaluating the appropriateness of the psychometric policies and procedures of credentialing boards. Gross (1989) analyzed the results of 549 candidates who completed the 150 criterion-referenced multiple choice questions on the NREMT-P written examination between July 1 and October 24, 1988. The examination was divided into six sections each having a pass-fail standard. The overall pass-fail cutoff score was 72 percent. The mean score for the 549 candidates was 78.4 percent. Of the 549 candidates; 16.8 percent failed based on total test score. An additional 8.4 percent failed the test because of deficient performances in one or more sections. The

Kuder-Richardson reliability was .85 (Gross, 1989). The pass-fail standard for the NREMT-P written examination was based on the judgments of subject matter experts' assessments of how practitioners should be able to perform.

The EMT-P has provided emergency medical intervention outside the traditional hospital setting. Sophisticated medical treatments administered in the prehospital setting for victims of sudden illnesses or injuries have been the end products of a rapid expansion in medical technology. Accordingly, medical care previously available only from a physician in a hospital setting has been made available in a person's home, in industrial complexes, and in natural or man-made disaster settings, or by the roadside.

Cost Effectiveness, Efficiency and EMT-P Educational Programs

Alfred (1991) offered the following definition of effectiveness when discussing assessing effectiveness in community and technical colleges:

> An attribute of importance in American higher education is its diversity. Differences exist among institutions. These differences lead to variation in the criteria for effectiveness. As client-centered institutions, community colleges employ a wide variety of programs and services in a compact service region to meet the needs of diverse groups. Like other service organizations, they are effective when individuals and groups hold favorable perceptions of their performance in important activities, or "successful organizational transactions." Transactions differ however, in accord with the needs of each group and a successful transaction for one
>
> It is precisely this point that identifies some of the most important findings about community college effectiveness in the University of Michigan study. These findings can be summarized as follows. Effectiveness in community colleges is determined by the presence of paradox. To be effective an institution must possess attributes that are simultaneously contradictory, even mutually exclusive.
>
> Paradox exists when community colleges employ what seem to be contradictory yet equally necessary programs, policies and delivery systems to adapt to rapidly changing conditions and needs in the service region (p. 2).

Quality, cost, and efficiency have been major issues higher education administrators face in a time when the public has demanded accountability of higher education institutions. A declining population of college age students and declining state and federal subsidies for education have forced higher education systems to measure or demonstrate the quality of their products in relation to the costs of those programs.

Leaders in business and industry were introduced to the concept of scientific management in the early 1900s by Frederick Taylor (1911). The efficient business increased productivity while maintaining the same costs. Taylor stated that a business could become more efficient by developing a scientific method for each task and reducing the deliberate "soldiering" of workers doing less than they were able (Taylor, 1911). The need to reduce expenditures was added to Taylor's theory of increased productivity by Frank Spaulding in 1913 (cited in Callahan, 1962). Bowen (1980) defined efficiency as "the relationship between means and ends" (p. 229). The greater the ends achieved with given or fewer means, the greater the efficiency of the endeavor (Bowen, 1980; Jones, 1984). The terms benefit-cost analysis, cost/effectiveness analysis and benefit-cost/utility analysis, inputs-outputs and resources-outcomes have been used to describe efficiency (Snider, 1989).

Bowen (1980) stated:

> Regardless of the terminology the underlying concepts of this efficiency are (1) that the use of resources involves an opportunity cost and results in an outcome, and (2) that efficiency is measured or judged as a ratio between the outcome and the cost (p. 230).

Ganiats (1988) discussed the principles of cost-effectiveness research and pointed out,

> Any program will have not only dollar costs and dollar benefits but also nondollar costs and benefits. The terms cost and benefit have lost clarity, as they have been used to refer to both the dollar and nondollar elements

> of the analysis. There are many ways of interpreting the phrase cost effective: the program either (1) saves money, (2) is effective, (3) saves money and is at least as effective as the standard, or (4) has an additional effectiveness worth the additional cost (p. 77).

Bowen (1980) argued for the strength of the relationship between cost and outcomes in the education programs. He identified two major errors made when studying the efficiency of education programs as "(1) efficiency is judged only by cost and (2) that efficiency is judged only by outcomes" (1980, p. 230). Terenzini (1989) observed:

> Although a reasonable argument can be made that undergraduate program quality and resources invested are not independent, the increased emphasis on assessment has radically altered the nature of discussions of undergraduate program quality. Increasingly, claims to quality must be based not on resources or processes, but on outcomes (p. 645).

Administrators in higher education have changed the focus of accountability of higher education from an "input" system of requiring a set number of hours to complete a curriculum, to an "outcome" system in which the expected competencies of graduates were stated in measurable terms (Snider, 1989). Stating outcomes in measurable terms expressed the intended quality of the curriculum. Measuring the student achievement of outcomes measured the quality of the system (Snider, 1989). Student outcome measures have been mandated by state governing agencies and regional and professional accreditation bodies. The AMA Committee on allied Health Education and Accreditation (CAHEA) set forth the following position in 1991:

> During the past few years, educational, regulatory political groups have focused on educational effectiveness as a primary goal in American postsecondary education....CAHEA has been proactive in responding to the US Department of Education's criteria, which emphasize measuring educational effectiveness and to the Council on Postsecondary Accreditation's provisions, which specify that an accrediting body use evaluative processes and criteria that judge educational outcomes.

> Accreditation is the primary self-regulatory means of quality educational assessment; it gathers appropriate information on programs and has knowledgeable professionals appraise them. By incorporating an assessment of outcomes into its policies and procedures, CAHEA assures that the 20 review committees with which it cooperates also are in compliance with the US Department of Education and the Council on Postsecondary Accreditation's provision.
>
> Committed to using assessment as a principal method for determining educational quality, CAHEA must assure that accredited programs use effective methods of program assessment (p. 968).

Terenzini (1989) discussed the pitfalls associated with studying student outcomes as a measure of the efficiency of a program. He stated that:

> Perhaps most importantly, assessment requires a redirection of institutional attention from resources to education. Now that the costs of a college education are identifiable and measurable, important people (for example, legislators, parents, students) now want to know what the return is on their investments. What does one get out of a college education? (p. 645)

Overinvestment in College Training, Richard Freeman (1975) questioned the economic value of investing in a college education. Leslie (1988) reviewed critiques of Freeman's findings and discussed flaws in the research design, which Leslie believed led Freeman to conclude erroneously that the costs of college outweighed the benefits. However, the practice of estimating the rate of return on investment in higher education has been an accepted economic method of estimating the benefits of obtaining a postsecondary education, as stated in the following comments on the rate of return on the investment in a college education:

> The rate of return is an estimate or profile of the expected lifetime earnings for college graduates and nongraduates minus college cost estimates and costs associated with attendance estimates, with all costs adjusted for dollar inflation. Economic theorists, acknowledging that satisfaction in a chosen career does not rely solely on level of reimbursement, calculate the rate of return in areas besides income, including social and personal gains and contributions to society made by persons with advanced education (Leslie, 1988, p. 125).

Bowen (1980) reported the following regarding the cost investment in higher education:

> Societal decisions about higher educational institutions are affected not only by cost but also by expectations of benefits to be received from higher education. Higher education, like all other forms of production, is subject to diminishing returns. As expenditures increase, each incremental addition to expenditure may yield fewer or lesser benefits. For example, successive improvements in quality--distinction of faculty, higher faculty-student ratios, elaboration of equipment, additional library resources, architectural refinement--may have a diminishing effect on outcomes until a point is reached at which they have no effect or a negative effect on performance. As higher education expands, it may attract less qualified and less motivated students, which also may eventually bring about reductions in incremental outcomes. Tendencies toward diminishing returns means that as higher education expands, the incremental returns decline and the amount people are willing to pay for additional units of higher education correspondingly tends to fall (p. 12).

Dick (1989) observed:

> EMS workers are helpers. They derive a large percentage of their job-related rewards from helping people. It's a good thing, too, because more than one-half the United States receives its EMS from volunteers. If your primary drive in life is making money, you wouldn't be very happy in EMS (p. 16).

The relationship between the student's initial financial investment in emergency medical technology education and the entry level salary for an EMT-P is not clear. Variables such as the type of service, whether in a public or private institution; the location of the service, whether, urban, suburban or rural; and the geographic area served contribute to the difficulty in estimating the value of the original educational investment. Since 1987 The Journal of Emergency Medical Services has conducted an annual salary survey of selected emergency medical services. The survey sampled 97 emergency medical services throughout the United States. Although the sample was not randomly selected, the same organizations participated yearly and the methodology for collection and analysis of the data remained the same; providing a degree of stability for the information. Findings from the 1989-90 survey reported that the average 1989 salary for EMT-P's was $26,210, representing a 4.0 percent increase in compensation from 1988 to 1989 and the average starting salary in 1989 for EMT-P's was $24,540 (Keller, 1990). Ornato (1989) found that the average cost for a paramedic education program in 1988 was $1,580. The initial education investment qualified the graduate EMT-P for a position with a starting salary of $24,540. Included with the salary was an extensive employee benefit package (Keller, 1990).

There has been an increase in the development of allied health professions since the passage of the Allied Health Training Act in 1966. The number of educational programs for the new professionals has increased as a result of that act. The subject of costs associated with allied health education programs is not new. Harper (1977) observed that the increase in the number of programs, economic factors, and rapid technical advances would continue to increase the costs of Allied Health professional education. The cost of providing educational programs to prepare an EMT-P was predicted to be a constraining force on the availability of emergency medical health care nationally (Occupational Outlook Handbook, 1991). Considerable discussion had centered on the appropriate amount of education an emergency medical technician-paramedic should possess in order to function effectively in the field setting (Jones 1989). Higher levels of training for health care providers have resulted generally in higher salaries and in turn contributed to the cost of the service. EMT-Ps with associate degrees or a bachelor's degree commanded higher salaries generally, and have had more promotional opportunities (Jones, 1989). However, the certificate level technical training program has been the predominate education preparation for the emergency medical technician--paramedic in the United States as of 1989 (Jones, 1989).

The cost of the technical curriculum EMT-P course for a student has ranged from $700 to more than $4,000. This has included 750 to 2,000 class hours depending on state and local requirements. The course has taken from four months to two years, depending on its intensity and whether it was presented part-time or full-time (Smith, 1989). Anatomy and physiology as well as pathophysiology of various injuries and diseases have been studied in depth. Students learned advanced methods of emergency patient management, such as endotracheal intubation, the intravenous administration of medications, cardiac monitoring, and defibrillation.

All levels of emergency medical technician education have had to meet or exceed the minimum guidelines established by the U.S. Department of Transportation (USDOT) and were regulated and certified at the state level. The National Registry of Emergency Medical Technicians has been the national body that administered certifying examinations for emergency medical technicians. Many states have required completion of a rigorous national board examination (NREMT) covering both cognitive and psychomotor skills as a prerequisite for state certification (National EMS Clearinghouse, 1989). Emergency medical technicians have been able to administer patient care only under the delegated medical authority of a physician (Occupational Outlook Handbook, 1991).

The United States Bureau of Labor Statistics yearly publication The Occupational Outlook Handbook, (1991) contained the following observations regarding employment opportunities for emergency medical technician-paramedics:

- employment opportunities for emergency medical technician-paramedics are projected to grow as fast as the average for all occupations through the year 2000.

- The aging of the population will create more opportunities in all health care areas.

- Rapid technological advancements in emergency health care may increase the demand for advanced life support services.

- A decline in the number of 18-24 year-olds will require more communities to rely on paid rather than volunteer emergency medical technician-paramedics for advanced emergency care.

- The expansion of emergency medical services and emergency health care may create new job openings for the declining applicant pool.

- The relatively high turnover rate in emergency medical services where the practitioner is subjected to "heavy responsibilities, risky working conditions, and modest pay" will increase job opportunities.

- The decrease in the number of prospective volunteers combined with an increase in demand for the service may result in an increase in average salary for emergency medical technician-paramedics (p. 198).

The Handbook identified "the rising cost of training and equipping emergency medical technician-paramedics" (p. 198) as the major constraining factor for job growth. "Citizens will have to decide the level of emergency care they are willing to support; benefits of emergency medical services will have to be weighed against the cost of providing the service" (Occupational Outlook Handbook, 1991, p. 198). "The current taxpayer resistance to increased local government spending may also constrain growth within the emergency health care field" (Occupational Outlook Handbook, 1991).

The cost of educating and equipping health care practitioners has contributed to the rapid increase in health care costs. A reversal in this trend without a significant change in the manner in which health care is delivered was set forth by Vincenzino (1991) in the following statement:

> Extensive efforts to restrain the rise in health care costs have not had a pronounced impact. The health care system in the United States has undergone significant changes, and as we entered the 1990s, a shift toward managed care was gathering momentum. Nevertheless, spending on medical care continues to rise by nearly 10 percent a year, thus increasing the percentage of GNP these costs represent. With substantial progress in lowering the rise of health care costs unlikely in the near future, the debate over some form of national program is bound to intensify.

The last decade saw two major changes occurring in the health care industry, both intensifying the crisis in health care. First, the federal government's enactment of a prospective payment system for Medicare and Medicaid in 1983 drastically changed the way the health care industry did business. The change provided insurance companies with a method to reward efficient delivery financially and penalize inefficient delivery of health care services financially (Averill, R., Kalison, M., 1985). Insurance companies no longer functioned simply as a conduit for a dollar flow between the insured consumer and the institution or private practitioner. Insurance carriers attempting to maximize profits while operating within the new prospective payment system implemented policies aimed at containing health care costs (Averill, 1985).

The second major change in the health care industry occurred as hospitals, struggling to contain rising costs and comply with requirements for reimbursement implemented by insurance companies, shifted the focus of hospital care from inpatient to outpatient services. Attempting to maximize their revenues, hospitals diversified. Hospitals became comprehensive health care systems offering services such as daycare, hospice, and home health care. These two major changes occurred during a time of a declining economic environment. Many hospitals without the financial strength to diversify or the population base required to survive in the reformed health care industry closed (Office of Technology Assessment, 1989).

The difficulties faced by universities with health education programs was compounded by the health care crisis emanating from uncontrolled increases in costs. Heany (1984) discussed the factors affecting health education programs within the framework of a changing health care system and a changing higher education system:

> It is inevitable that universities involved in educating for the health professions will be influenced by changes both in higher education and in the health professions. And, conversely, universities with health science programs have some influence on both higher education and health care. At present, the complex world of these mutual interactions is in a state of crisis because modes of operating no longer adequately solve the problems of either the educational system or the health care system. This crisis is evoking reassessment and changes in the institutional self-concept of universities with health professions programs. These changes are of such a fundamental character that they constitute, for both universities, true shifts in operative paradigms (p. 42).

The cost of educating providers in specialized health care fields has increased yearly (Halstead, 1991). Originally funded by generous federal appropriations for the development of a national emergency medical system, prehospital emergency medical systems, and education programs experienced rapid growth during the late seventies and early eighties. The federal government had funded more than 300 regional projects by 1974. These projects trained emergency medical technicians, purchased equipment, and defined the structure of emergency medical services (Page, 1989). The USDOT-NSTC-P was revised and expanded in 1985 to reflect the need to prepare students to function at increased levels of technical sophistication. Educational preparation to meet the roles and responsibilities of an EMT-P has expanded and become increasingly sophisticated compared to the curriculum content of the initial federally funded programs. This expansion and increase in the levels of program sophistication was emphasized in the following statement from The National EMS Clearinghouse:

> Throughout the decades of the '60s and '70s significant developments in emergency medical delivery systems occurred that have enhanced the systems' overall effectiveness. Today, emergency medical services EMS systems continue to experience technological innovations and programmatic changes in response to demands for more timely and effective prehospital health care delivery systems (National EMS Clearinghouse, 1989, p. 42).

The initial expense of EMT-P education and the expense of continuing education mandated by state regulatory agencies continues to increase (National EMS Clearinghouse, 1989).

Surveys such as Ornato's (1989) provided information on costs per student for emergency medical technology education programs. However, the factors which generated the costs were not identified. Fraser and Wright (1978) recommended that cost figures should be determined by a specific set of relationships that could be manipulated. The data were to include student enrollments, curriculum characteristics, faculty characteristics and institutional characteristics. "A cost-per-student calculation that does not show the relationship of these factors to the total cost of an educational program provides no information to administrators that can be used to in program planning and review" (Fraser, 1978). A model that allowed for the identification of specific factors that influenced the current costs of emergency medical technology education programs could be useful to administrators in predicting the costs of programs in the future (Kolter, 1981).

Cost Calculation Models

Research conducted by Gonyea and Harper (1978) produced a cost calculation model titled Program Cost Construction. The Program Cost Construction model developed by Gonyea and Harper has been applied to educational programs in various health fields including chiropractic, dentistry, allied health, pharmacy, nursing, osteopathy, and medicine (Snider, 1989). Gonyea described her cost analysis model as having the following four elements:

> Each program is described carefully in terms of the organization of its curriculum, the departments responsible for teaching its courses, the number of credit hours as well as the modes of instruction and student group sizes associated with the various courses. Using these descriptions the student contact hour (SCH) requirements are identified and summarized and the resulting total student enrollment determined.
>
> The student element is described in terms of the number of students in each entering class.
>
> On the basis of the data derived from these two elements, the number of faculty contact hours required to deliver the instruction to the students is ascertained.
>
> The faculty element is carefully described. In each course mode, the type of faculty necessary to teach the faculty contact hours is determined. The faculty analysis and description also includes the organization of the faculty by type, the actual amount of direct contact hours each type provides and their defined availability for direct contact teaching. From these data the faculty full-time equivalents required to deliver the curriculum requirements for the program are ascertained. Faculty salary data by type is defined for each of the teaching responsibility units which supply instruction to the program being studied. Faculty costs for each of the units responsible for teaching is thereby determined and the relationship to the total cost is established.
>
> Academic support costs for the program are also determined for each of the areas providing support services to the program. By adding the faculty costs and other costs associated with the various teaching responsibility units, total costs are accumulated. These costs are then divided by the total enrollment for each program to ascertain the total cost per student.

The methodology also allowed the determination of the average cost per student per year for each year of the program (Gonyea, 1978, pp. 84-87).

The Program Cost Construction model developed by Gonyea and Harper, describes the total cost of a program based on an identification of key elements that contributed to the cost. The key elements identified by Gonyea and Harper (1978) were categorized as the:

program cost elements of:
organization of the curriculum
faculty responsible for instruction
number of student contact hours
mode of instruction
size of the instructional groups

student cost elements of:
class size
program length
student contact hour requirements
attrition

faculty cost elements of:
required teaching contact hours per week
salaries

costs elements of:
support personnel
indirect costs of instruction

Difficulties arose, according to Harper (1978) when examining the costs associated with allied health education programs. Allied health educational programs were grouped into schools of allied health in universities or in divisions of allied health technologies in community colleges. Harper, (1978) commented:

> Allied health professions education programs are extremely diverse. There are over twenty-five separately accredited programs that award certificates and degrees at all levels, and there are many more programs that are not accredited in association with the AMA that are preparing allied health professionals. The programs may be offered entirely by one department,

> by several units in one institution, or by multiple units in separate institutions. In other words, of all the health profession education programs, allied health is probably the most complex (p. 74).

The diversity and complexity of allied health professions education programs have been identified as factors increasing the difficulty of conducting studies of allied health and nursing education program costs (U.S. Department of Health and Human Services, 1986; Brown, 1980; Bowen, 1980; and Harper, 1973).

Following a study of associate nursing component expenditures in selected Ohio public, two-year colleges Brown (1978) concluded the following regarding the investigation of costs associated with health technology education programs:

> During the last several decades, numbers of cost or expenditure models have been developed for determining educational expenditures and allocating resources within the two-year sector of public higher education
>
> Nevertheless, models are based on the availability of and opportunity to obtain cost data. The computations of the expenditure per student contact hour in nursing within this investigation would have been more accurate had direct instructional expenditure data for each program been obtainable. Most program directors were only able to furnish faculty salary data.
>
> Within the public two-year college system in Ohio, associate nursing is classified as a health technology. These programs are often housed in divisions of colleges offering multiple health programs and specific nursing instructional expenditures are not readily extracted. Moreover, instructional supplies, secretarial, and other support service requirements are often shared among health technology programs. If nurse educators are to become more knowledgeable regarding data needed for expenditure models, it would appear timely that the National League for Nursing, or a similar professional body, should isolate uniform cost data classifications basic to nursing education in institutions of higher education. It would appear that these would be required for future investigation of nursing education expenditures. Also, if specific programmatic cost data are essential for cost studies, higher education administrators should maintain expenditure records, in addition of faculty salaries, for other direct instructional costs (p. 144).

The technical segment of the emergency medical technology program has unique characteristics that should be considered in analyzing educational costs. Among these characteristics are:

- A pre-established curriculum developed by the U.S. Department of Transportation National Standard Training Curriculum-Paramedic (DOT-NSTC-P). The DOT-NSTC-P contains behavioral objectives and skill objectives. Instructors' lesson plans and lecture outlines are also included.
- The integration and the application of the DOT-NSTC-P curriculum content within an individual program is reviewed as a requisite for CAHEA accreditation.
- The technical curriculum is clearly delineated into didactic, clinical and field instruction.
- The number of hours in the clinical segment of the technical curriculum is left to the discretion of the program administrators. However, the members of the accreditation committee determine if the clinical hours are sufficient to meet the skill objectives contained in the DOT-NSTC-P.
- The Emergency Medical Technology field is a young allied health area (10-15 years). Faculty may be emergency medical technician-paramedics without undergraduate preparation, reducing variance in instructor salaries based on academic preparation.

These characteristics of emergency medical technology programs produced a modification of the program cost construction model (Gonyea, 1978), to analyze the costs associated with the technical segment of the emergency medical technology program. The modified program cost construction model was used on this study.

Summary

Programs for the education of emergency medical technician-paramedics have existed for over 20 years in the United States. Large scale cost studies of health professions, in particular those of medicine and nursing, have been undertaken and funded by professional organizations as well as the federal government. Studies have also been conducted that examined the costs associated with nursing and allied health educational programs (U.S. Department of Health and Human Services, 1986; Brown, 1980; Bowen, 1980; and Harper, 1973). The costs of developing and maintaining the technical curriculum of emergency medical technician-paramedic programs have not been studied. A historical review of the literature revealed that no attempt had been made to study the expenditures or the cost of emergency medical technology education. None of the literature provided any data on direct departmental cost associated with the technical curriculum of EMT-P education in accredited two-year colleges. One study revealed that directors of state emergency medical services agencies in 24 states were unable to provide an average cost to the student for emergency medical technician-paramedic educational programs (Ornato, 1988).

The passage of the Emergency Medical Services Systems (EMSS) Act in 1973 authorized the Department of Health and Human services to fund the development of comprehensive regional EMS systems. Guidelines for education and provision of major funding for training, equipment and the development of regional emergency medical systems resulted. The early emergency medical technician education or training programs were developed using this federal "seed" money in the late 1960s and early 1970s. For the most part, the programs were hospital-based. Hospital administrators viewed establishment of an EMS training program as a method to increase patient flow into the emergency departments, as alumni of the program opted to transport patients to the hospital they had graduated from and with whose staff they were most familiar.

Emergency medical technician educational programs have proliferated since that time. In addition, there has been an increase in the complexity and content of the EMT-P curriculum (National EMS Clearinghouse, 1989). Specific essentials for the accreditation of EMT-P educational programs have been developed, both at the state and national levels.

In addition to the development of emergency medical technicians as an allied health profession, there has been an increase in the number of allied health professions, in general, since the passage of the Allied Health Training Act in 1966. The subject of costs associated with allied health education programs is not new. Harper (1977) observed that the increase in the number of programs, economic factors, and rapid technical advances would continue to increase the costs of Allied Health professional education. A significant contributor to the cost of health care services has been the cost of medical, nursing, and allied health care educational programs (Fiesta, 1992; Halonen, 1976; Hammersberg, 1982; Smith, 1975).

Bowen (1980), Ganiats (1988), and Terenzini (1989) discussed the shift toward a new system of accountability in higher education programs resulting from the reduction, retrenchment, and reallocation of financial resources in the 1980s. Snider (1989) discussed the focus of accountability for higher education administrators shifting from a system of requiring a set number of hours to graduate to a system in which the expected competencies of graduates are stated in measurable terms.

The relationship between the initial investment in education and lifelong benefits as described by Freeman (1975) was reviewed. National salary surveys for EMT-Ps conducted on an annual basis since 1987 by Keller were reviewed. The salary information was compared to the Ornato (1989) student fee survey. Research conducted by the federal government (Occupational Outlook Handbook, 1991) and by The National EMS Clearinghouse, 1989, suggested that the need for emergency medical technicians will increase and identified "the rising costs of training and equipping emergency medical technicians" as the major constraining factor for job growth.

Writings of Bowen, Douglas, Fraser, Wright, Gonyea, Harper, and other experts in investigating the costs associated with the delivery of higher education programs were reviewed. It was noted that total college enrollment, class size, college control (public or private), type of college (university, four-year college or two-year college), faculty salaries, length of service, faculty contact hour teaching load, and student-faculty ratios were among the many factors that affected total instructional expenditures for programs within institutions of higher education. The unique characteristics of the technical core curriculum of the emergency medical technology program, based on the researchers' experience, that need to be considered when analyzing educational costs were presented.

No major studies on factors affecting the expenditure for the technical core curriculum for associate emergency medical technology education programs were evident in the literature of the past two decades even though CAHEA accredited programs numbered 67 (JAMA, 1990), and other non-CAHEA accredited programs were estimated to number between 400 and 500 programs nationally, (Occupational Outlook Handbook, 1991).

CHAPTER 3

METHODOLOGY

The methods used in this study are described in Chapter 3. It includes a statement of the problem, the purpose of the study, a description of the subjects, the variables considered, the research questions proposed, the instruments for data collection, the collection of the data, and the statistical measurements employed.

Statement of the Problem

Cost increases associated with providing educational programs to prepare EMT-Ps may restrict the future availability of emergency medical health care nationally (United States Bureau of Labor Statistics, 1991). The soaring cost of health care in the United States has created a demand for accountability in the allocation and delivery of medical services and resources by the public (Goldfarb, 1991). Expensive components of the health care system, such as emergency medical services, have been increasingly required to justify their costs. A significant contributor to the cost of health care services has been the cost of medical, nursing and allied health care educational programs (Fiesta, 1992; Halonen, 1976; Hammersberg, 1982; and Smith, 1975).

Large scale cost studies of health professions, in particular those of medicine and nursing, have been undertaken and funded by professional organizations as well as the federal government. Studies have also been conducted, that examined the costs associated with nursing and allied health educational programs (U.S. Department of Health and

Human Services, 1986; Brown, 1980; Bowen, 1980; and Harper, 1973). The costs of developing and maintaining the technical curriculum of emergency medical technician-paramedic programs have not been studied. A national survey revealed that directors of state emergency medical services agencies in twenty-four states were unable to provide an average cost for emergency medical technician-paramedic educational programs (Ornato, 1988).

A trend toward closure and consolidation of health care facilities enhanced the importance of emergency medical systems. Stabilization of patients prior to extended transportation time has gained acceptance as an important influence on survival rates of critically ill or injured persons (Patton, 1989). However, research is needed to identify the essential elements of a successful EMS system (Patton, 1989). The education of EMS providers is an essential element for the provision of prehospital emergency medical care.

The Education Commission of the States (1980) recognized that the recurring theme for postsecondary education in the 1980s would be that: "the squeeze of inflation and limited resources will have a major impact on all the areas of coordination and governance, from planning to program review of new and existing programs, to finance and budget." Senior administrators at 444 universities, colleges, and community colleges were asked in 1990 what constituted the major challenges facing post-secondary educational institutions in the next five years. Sixty-two percent of the community college administrators in this study identified procurement of "adequate finances" as the biggest challenge they would face in the next five years (The Almanac of Higher Education, 1991).

Criticisms of the value of higher education have emphasized the need for assessment and accountability within the academic setting (Leslie, 1988). This concern for quality and efficiency in the management of higher education occurred at a time of declining enrollments and funds (Jones, 1984). Terenzini (1989) observed, "Now that the costs of a college education are identifiable and measurable, important people (for example, legislators, parents, students) now want to know what the return is on the investment." An environment of competition among and within institutions for students and funds has resulted. Administrators in higher education have a serious interest in the impact of educational program costs on their institutions (Bowen, 1972; Fraser, 1978; Gonyea, 1978).

None of the literature or cost studies nor any information available in the national office of CAHEA provided any data on direct departmental cost associated with the technical curriculum of EMT-P education in accredited two-year colleges. A significant program planning problem existed because of lack of information on this matter. The lack of information of this type is a hinderance to community college efforts to provide EMT-P education programs.

A determination of the expense of providing the technical curriculum of educational programs to educate EMS personnel may be helpful in identifying historical and future trends in financing patterns. Patterns of financing EMS services can only be determined after identification of the costs associated with essential elements of the service.

The Purposes of the Study

The purposes of the study were two-fold. The first was to survey, analyze and report direct departmental costs associated with the development of the technical curriculum of EMT-P educational programs in 12 associate degree emergency medical technology programs offered by public two-year community colleges in the United States which graduated students in the 1991-1992 academic year. The 12 associate degree medical technology programs were accredited by the Joint Review Committee for Educational Programs for Emergency Medical Technician-Paramedic (JRC/EMT-P), a subcommittee of the Committee on Allied Health Education and Accreditation (CAHEA). The 12 programs were located in states that require successful completion of the National Registry of Emergency Medical Technicians (NREMT) Advanced Level written and practical examinations as a prerequisite to state certification as an EMT-P. The second purpose was to analyze the direct departmental costs associated with the technical curriculum of the selected EMT-P educational programs for the academic years 1989-90, 1990-91, 1991-92.

The technical curriculum was the course work within the two-year associate degree plan of study that prepared the student to function as an EMT-P and was comprised of the United States Department of Transportation National Standard Training Curriculum-Paramedic (USDOT-NSTC-P, 1985). The study will identify the direct departmental costs of the instructional components of the technical curriculum and a model based on previous research for analyzing the cost per contact hour of the technical curriculum of EMT-P educational programs was developed.

A determination of the expense of providing the technical curriculum of educational programs to educate EMS personnel may be helpful in identifying historical and future trends in financing patterns. Patterns of financing EMS services can only be determined after identification of the costs associated with essential elements of the service.

Information gained from the study may assist administrators in estimating the direct departmental costs for the establishment of EMT-P educational programs. The study may provide existing EMT-P educational programs with a method for estimating direct departmental costs associated with a program's expansion, revision, or continuation.

Emergency medical technology program directors have based administrative decisions on experience or have relied on information regarding costs of other allied health education programs for program planning and development. This information was not based on the cost experiences of emergency medical technology programs. Information regarding the costs of specific educational programs should prove useful for administrators and others involved in resource allocation.

The Institutions Studied

The structure and content of emergency medical technology programs offering only the technical curriculum or certificate level rather than associate degree level, varied greatly from state to state. A 1989 national survey found that:

> "If there is any one conclusion to be drawn about the breakdown of hours EMS providers spend in getting trained, it is that there is absolutely no consistency from state to state, and there is often little or no consistency in what was reported three years ago versus what is being reported today" (National EMS Clearinghouse, 1989).

Seventy-three CAHEA accredited emergency medical technology programs in the United States graduated students in the academic years 1989-90, 1990-91, and 1991-92. Twelve programs met the following criteria: (1) a program located in public two-year community or technical college and (2) a program located in a state that required the successful completion of the National Registry of Emergency Medical Technicians (NREMT) Advanced Level examination as a prerequisite for state certification. The 12 programs were located in Alabama, New Hampshire, Ohio, Washington, and Mississippi. The subjects for this study consisted of these 12 associate degree emergency medical technology programs.

The 12 associate degree programs for EMT-P were 22-23 months in length for a full-time student and were conducted in semester and quarter formats. The technical core curriculum which conformed to the United States Department of Transportation-National Standard Training Curriculum-Paramedic (USDOT-NSTC-P) was 7-12 months in length. The technical curriculum consisted of lecture, laboratory (on-campus), and clinical experience (both directed practice and field internship). The study examined the cost per contact hour of instruction. A contact hour was based on Gonyea's (1977) definition: a unit of measure that represented one hour of instruction given to one student in one week.

Commonalties of public sponsorship of the institution, the program's professional accreditation through CAHEA, and the required successful completion of the National Registry of Emergency Medical Technicians-Advanced Level examination as a prerequisite for state certification were considered essential for collecting, reporting, and comparing expenditure data from those associate degree emergency medical technology programs selected for the study. Each program director was invited by mail to participate in the study. Eleven of the 12 program directors were interested in the study. The National Registry of Emergency Medical Technicians and the Committee on Allied Health Education and Accreditation, Joint Review Committee for Emergency Medical Technician-Paramedic programs also expressed an interest. This interest demonstrated that Emergency Medical Technician education program cost data could be useful to emergency medical technology educators, EMS professional organizations, accreditation committees, and public higher education administrators.

Definitions of Key Terms

The following definitions were established. They were:

Academic year: A consecutive block of time that is institutionally designated as the academic year. An academic year may be equivalent to a fiscal year or may include only some of the sessions during with course work is offered. Most typically an academic year is equated to two semesters or three quarters (Harper, 1977).

Advanced Life Support: (ALS) the use of adjunctive equipment, advanced airway techniques, cardiac monitoring, defibrillation, intravenous lifeline, and drug infusions.

American Medical Association's Committee on Allied Health Education and Accreditation (CAHEA): The specialized accrediting body for accrediting educational programs that prepare personnel for 26 allied health occupations. CAHEA sets standards and accreditation procedures by working with relevant medical specialties, allied health professions, and other organizations to draft national standards (Essentials) and to establish collaborative relationships with interested parties (JAMA, 1990).

Associate degree: A degree granted for the successful completion of a sub-baccalaureate program of studies, usually requiring at least two years (or equivalent) of full-time college-level study. This includes degrees granted in a cooperative or work-study program (NCES, 1991).

Clinical experience: Patient care by a student under the supervision of a clinical preceptor for the purpose of instruction and training (Harper, 1977).

College: A postsecondary school which offers general or liberal arts education, usually leading to an associate, bachelor's, master's, doctor's, or first-professional degree. Junior colleges and community colleges were included under this terminology (NCES, 1991).

Community and junior colleges: "Two-year institutions offering a variety of programs that might include credit-free instruction, liberal arts courses, professional/technical courses, degree and nondegree programs, and adult and continuing education." (Levine, 1988).

Contact hour: A unit of measure that represents one hour of instruction given to one student in one week (Gonyea, 1978).

Credit: Credit is a time-based, quantitative measure assigned to courses or course-equivalent learning. A credit is to be defined as 50 minutes of instruction per week per term. As terms vary in length, credits were usually referred to as semester or quarter credits. Unit and credit hour were synonyms for credit (Levine, 1978).

Department of Transportation National Standard Training Curriculum-Paramedic (DOT-NSTC-EMT-P): The curriculum and guidelines developed by the federal government and used throughout the United States in educating basic-level EMTs to function in the paramedic role (McKay, 1985).

Didactic: Communication for the purpose of instructing (Harper, 1977).

Direct costs: Those costs which were directly assignable to the program (Harper, 1977).

Emergency Medical Technology Program Technical Curriculum: The portion of the associate degree offering based on the DOT-NSTC-EMT-P required for certification as an EMT-P by the state in which the education program is located.

Emergency Medical Services: The personnel, vehicles, equipment, and facilities used to deliver medical care to those with an unpredicted immediate need outside a hospital and continued care once in an emergency facility.

Emergency Medical Technician-Paramedic (EMT-P): A person specially trained and certified in accordance with state regulations who renders rescue and emergency medical services and, in conjunction with a cooperating licensed medical doctor, doctor of osteopathic medicine and surgery or a physician advisory board, may perform the following life support or intensive care techniques:

1. Cardiac monitoring
2. Defibrillation
3. Airway or gastric intubation
4. Relief of pneumothorax
5. Administration of appropriate drugs and intravenous fluids.

Expenditures: Charges incurred, whether paid or unpaid, which were presumed to benefit the current fiscal year. For institutions of higher education, these include current outlays plus capital outlays.

Faculty: Any personnel having the majority of their activities (50 percent or more) in the instructional, research or public service activities of the institution's instruction, research and public service programs (Harper, 1977).

Full-time instructional faculty: Those members of the instructional and research staff who were employed full-time as defined by the institution, including faculty with release time for research and faculty on sabbatical leave. Full-time counts exclude faculty who were employed to teach less than two semesters, three quarters, two trimesters, or two 4-month sessions; replacements for faculty on sabbatical leave or those on leave without pay; faculty for preclinical and clinical medicine; faculty who were donating their services; faculty who were members of military organizations and paid on a different pay scale from civilian employees; academic officers, whose primary duties were administrative; and graduate students who assist in the instruction of courses (NCES, 1991).

Graduate: An individual who has received formal recognition for the successful completion of a prescribed program of studies (NCES, 1991).

Head Count Enrollment: The total number of students registered in a given school unit at a given time, generally in the fall of a year (NCES, 1991).

Higher education: Study beyond secondary school at an institution that offers programs terminating in an associate, baccalaureate, or higher degree (NCES, 1991).

Higher education two-year institution: An institution legally authorized to offer and offering at least a two-year program of college-level studies which terminate in an associate degree or were principally creditable toward a baccalaureate degree (NCES, 1991).

Instructional Cost: That category including expenditures of the colleges, schools, departments, and other instructional divisions of higher education institutions and expenditures for departmental research and public service which were not separately budgeted. Includes expenditures for both credit and noncredit activities. Excludes expenditures for academic administration where the primary function is administration (e.g., academic deans) (NCES, 1991).

Laboratory Instruction: Instructor prepares and supervises the execution of investigations by the class (Harper, 1977).

Lecture: Formal presentation of a prepared discourse. Primarily, one-way communication (Harper, 1977).

Metropolitan Statistical Area (MSA): A large population nucleus and the nearby communities which have a high degree of economic and social integration with that nucleus. Each MSA consists of one or more entire counties (or county equivalents) that meet specified standards pertaining to population, commuting ties, and metropolitan character. Towns and cities, rather than counties, are the basic units in New England. MSAs are designated by the Office of Management and Budget. An MSA includes a city and, generally, its entire urban area and the remainder of the county or counties in which the urban area is located. An MSA also includes such additional outlying counties in which the urban area is located. An MSA also includes such additional outlying counties which meet specified criteria relating to metropolitan character and level of commuting of workers into the central city or counties. Specified criteria governing the definition of MSAs recognized before 1980 are published in *Standard Metropolitan Statistical Areas: 1975*, issued by the Office of Management and Budget. New MSAs were designated when 1980 counts showed that they met one or both of the following criteria:

1. Included a city with a population of at least 50,000 within its corporate limits, or

2. Included a Census Bureau-defined urbanized area (which must have a population of at least 50,000) and a total MSA population of at least 100,000 (or, in New England, 75,000).

National Registry of Emergency Medical Technicians: Organized in 1970 to unify education, examination and certification of EMTs on a national level.

Part-time faculty: Those individuals who were expected to provide instructional related services only, i e., direct contact and preparation or those personnel who were re-designated as "part-time" in an official contract, appointment or agreement (Harper, 1977).

Postsecondary education: The provision of formal instructional programs with a curriculum designed primarily for students who have completed the requirements for a high school diploma or equivalent. This includes programs of an academic, technical, and continuing professional education purpose, and excludes vocational and adult basic education programs (NCES, 1991).

Quarter: The quarter calendar consists of three quarters with about 12 weeks for each quarter of instruction. There may be an additional summer session (Harper, 1977).

Semester: The semester calendar consists of two semesters during the typical academic year with about sixteen weeks for each semester of instruction. There may be an additional summer session (Harper, 1977).

Student: An individual for whom instruction is provided in an educational program under the jurisdiction of a school, school system, or other education institution (NCES, 1991).

Supply, equipment, travel costs: The costs related to the supplies, equipment, travel and other services resources that were used to directly or indirectly support the faculty in the process of achieving the program objectives (Harper, 1977).

Technical education: A program of vocational instruction that ordinarily includes the study of the sciences and mathematics underlying a technology, as well as the methods, skills, and materials commonly used and the services performed in the technology. Technical education prepares individuals for positions-such as draftsman or lab technician-in the occupational area between the skilled craftsman and the professional person (NCES, 1991).

Tuition and fees: A payment or charge for instruction or compensation for services, privileges, or the use of equipment, books, or other goods (NCES, 1991).

Undergraduate students: Students registered at an institution of higher education who were working in a program leading to a baccalaureate degree or other formal award below the baccalaureate, such as an associate degree (NCES, 1991).

Delimitations of the Study

This study was limited to the analysis of departmental costs associated with the development and maintenance of the technical curriculum of EMT-P educational programs in 12 associate degree emergency medical technology programs offered by public two-year community colleges in the United States accredited by the Joint Review Committee for Educational Programs for Emergency Medical Technician-Paramedic (JRC/EMT-P), a subcommittee of the Committee on Allied Health Education and Accreditation (CAHEA) and located in states which require the National Registry of Emergency Medical Technicians-Advanced Level examination for certification as an Emergency

Medical Technician-Paramedic. Generalizations to other emergency medical technology education programs which do not share these characteristics are limited.

The study was limited to comparisons of the cost of the technical core curriculum of associate degree emergency medical technology programs during the academic years 1989-90, 1990-91 and 1991-92.

No attempt was made to collect analyze or compare costs of the associate degree emergency medical technology programs other than those direct departmental expenditures associated with the technical component. The estimated expense for general and science education components of the total program were not included. The indirect program costs (i.e., library, physical plant maintenance, administrative and student support services) were not included. The students' expenses for course texts, uniforms and living expenses while enrolled were not included.

The Significance of the Study

The late '70s and early '80s witnessed a rapid proliferation of educational programs designed to prepare EMT-Ps to provide prehospital emergency health care. No study could be found which identified the direct departmental costs of the technical curriculum program costs of associate degree emergency medical technician-paramedic education programs in two-year public community or technical colleges in the United States.

A determination of the expense of providing the technical curriculum of educational programs to educate EMS personnel may be helpful in identifying historical and future trends in financing patterns. Patterns of financing EMS services can only be determined after identification of the costs associated with essential elements of the service. Information gained from the study may assist administrators in estimating the direct departmental costs for the establishment of EMT-P educational programs. The study may provide existing EMT-P educational programs with a method for estimating direct departmental costs associated with a program's expansion, revision or continuation. Emergency medical technology program directors have based administrative decisions on experience or have relied on information regarding costs of other allied health education programs for program planning and development. This information was not based on the cost experiences of emergency medical technology programs. Information regarding the costs of specific educational programs should prove useful for administrators and others involved in resource allocation.

The dilemma caused by rising costs associated with health care, compounded by the nineties' period of economic retrenchment and the lack of valid emergency medical technical education expenditure data, strengthened the belief that this study will be useful for future decisions of:

- administrators and faculty of associate degree emergency medical technician-paramedic education programs in two-year public community or technical colleges who were responsible for the budgets of these programs
- state coordinating boards of post secondary education
- the National Registry of Emergency Medical Technicians
- the Committee on Allied Health Education and Accreditation, Joint Review Committee for Emergency Medical Technician-Paramedic
- persons involved at the state or federal level in the revision of technical curriculum.

The Study Variables

Two dependent variables were used throughout this study. One dependent variable was the technical curriculum expenditures for the start-up of an initial program as reported by program directors. The second dependent variable was the total technical curriculum program expenditure for the academic years 1989-90, 1990-91, and 1991-92 as reported by the program directors.

There were two independent variables. They were: (a) The student contact hours in the technical curriculum, in the technical lectures, in the technical on-campus laboratories, and in the directed clinical and field internship experiences, (b) program characteristics of total student enrollment, number of faculty, faculty compensation, length of time the program had been in operation, attrition rates, and the first time pass rate on National Registry of Emergency Medical Technicians' paramedic level certification examinations.

The Research Questions

This study utilized a modification of the Gonyea Program Cost Construction model (1978) to investigate the following research questions:

Question 1: What is the relationship between the cost per student contact hour of the technical component of the CAHEA accredited associate degree emergency medical technician-paramedic education programs in selected two-year public community or technical colleges and the:

number of didactic contact hours in the program?

number of laboratory contact hours in the program?

number of clinical contact hours in the program?

number of hospital clinical sites used for student experience?

number of field internship contact hours in the program?

number of field internship clinical sites used for student experience?

total number of instructional contact hours in the program?

length of time the program has been in progress?

site of the community or technical college (metropolitan or rural)?

pass rate of the graduates on the National Registry Advanced Level-Paramedic examination?

Question 2: What is the relationship between the pass rate of the graduates on the National Registry Advanced Level-Paramedic examination and the:

number of didactic contact hours in the program?

number of laboratory contact hours in the program?

number of clinical contact hours in the program?

number of field internship contact hours in the program?

total number of contact hours in the program?

total program expenditures?

Question 3: What is the relationship between the pass rate of the graduates on the National Registry Advanced Level-Paramedic examination and the:

number of full-time faculty?

total number of part-time faculty?

average salary the full-time faculty receive?

average yearly expenditures for part-time faculty salaries?

average payment received by clinical preceptors?

Question 4: What is the relationship between cost per student contact hour of the technical component of CAHEA accredited associate degree emergency medical technician-paramedic education programs in selected two-year public community or technical colleges and the:

total head count enrollment in the emergency medical technician-paramedic education program?

total head count enrollment of the community or technical college?

rate of student completion of the program?

Question 5: What is the relationship between cost per student contact hour of the technical component of CAHEA accredited associate degree emergency medical technician-paramedic education programs in selected two-year public community or technical colleges and the:

total number of full-time faculty?

total number of part-time faculty?

average salary the full-time faculty receive?

average yearly expenditures for part-time faculty salaries?

average payment received by clinical preceptors?

Question 6: What is the relationship between the cost per student contact hour of the technical component of CAHEA accredited associate degree emergency medical technician-paramedic education programs in selected two-year public community or technical colleges and the:

percentage of salary calculated as fringe benefit for full-time faculty?

percentage of salary calculated as fringe benefit for part-time faculty?

program's secretarial services costs per year?

instructional supplies costs per year?

major equipment costs per year?

travel costs per year?

communication costs per year?

The Instruments

Two response instruments, accompanied by introductory letters explaining the study (see Appendix I) served as the data collection forms for the study. The instruments were:

The Emergency Technology Program Cost Questionnaire on which data on the institution characteristics, the program characteristics, faculty characteristics, and direct instructional cost for the technical curriculum of EMT-P educational program for the program's initial year of operation and the academic years 1989-90, 1990-91, and 1991-92 were reported (Appendix II). The direct instruction cost information form was adapted from the cost construction model developed and reported by Gonyea (1978, pp 78-79). The Gonyea program cost construction model has been used for national and state studies of various health care curricula since 1978. The methodology also allowed the determination of the average cost per student per year for each year of the program (Gonyea, 1978, pp 84-87).

The National Registry of Emergency Medical Technicians-Advanced Level examination results form for individual programs for each year for which budget information was collected (see Appendix III). The results requested the first time pass rate for graduates on the written segment of the examination.

The Emergency Medical Technology Program Cost Questionnaire was tested by the researcher prior to distribution to the study participants. Four program directors of associate degree health programs located in public two-year community colleges agreed to complete and critique the questionnaire. None of these program directors participated in the final study. Each director suggested changes in the format of the original questionnaire to increase ease of completion and to improve clarity. Two directors suggested changes in the questions regarding the student-to-faculty ratio in the clinical, classroom, and laboratory sections. The suggested changes were incorporated in the revised questionnaire mailed to the 12 program directors included in the study.

Method of Data Collection

The program director for each of the 12 emergency medical technology programs of public two-year community colleges in the United States, which were accredited by the CAHEA and were located in states which required successful completion of the NREMT-Advanced Level examination for state certification, was mailed an introductory letter from the researcher, The Emergency Medical Technology Program Cost Questionnaire, and a postage paid self-addressed envelope. Each questionnaire was numbered to provide a record of returns and to facilitate mailing of follow-up questionnaires. Each respondent was assured confidentiality. Each program was documented in the findings, by number only.

The Emergency Medical Technology Program Cost Questionnaire was mailed to the study population during the week of February 15, 1993. The director of the emergency medical technology program was requested to return the completed questionnaire by February 28, 1993. During the week of March 9, 1993, a postcard reminder was mailed to the program directors who had not returned completed materials.

A personal phone call was placed during the week of April 5, 1993 to the program directors who had not returned completed materials. A second Emergency Medical Technology Program Cost Questionnaire was mailed to the nonrespondents on March 9, 1993, with a letter referring to the follow-up phone call and requesting a response (see Appendix IV). A third and final mailing of The Emergency Medical Technology Program Cost Questionnaire to nonrespondents was conducted during the week of June 25, 1993. A modest incentive was included with this follow-up mailing in an attempt to increase response rate (Wiersma, 1991). August 30, 1993, was set by the researcher as the final date for receiving materials.

Nine program directors (75 percent) of the 12 program directors included in the study population returned completed questionnaires. The researcher contacted the remaining three participants by phone. Two of the three program directors stated the data were not available due to combined department costs, inaccurate data, or lack of record keeping. One program director declined to participate in the study. Only two of the nine respondents (22 percent) were able to report costs for the initial year of program operation. Follow-up phone conversations with the seven program directors who were unable to provide initial year of operation cost data revealed that the directors were either not involved in the initial year of program operation and that records associated with the initial year of operation were not available. The National Registry of Emergency Medical Technicians executive director was mailed a form requesting the examination results for each administration of the advanced level examination in the academic years 1989-90, 1990-91, and 1991-92 for the programs in the study.

The Statistical Procedures

As the subjects for this study constituted the entire population of associate degree emergency medical technology programs housed in public two-year community colleges in the United States accredited by the CAHEA and located in states which require successful completion of the NREMT-Advanced Level examination for state certification, descriptive statistics were employed to interpret the data. Frequency distributions, percentages, and means were used to analyze the data. The Pearson product-moment correlation was used to indicate the degree of relationship between specific variables in the questions posed. The Pearson product-moment correlation was chosen to determine the relationship between the variables reported on an interval scale.

The study design was reviewed and approved by The University of Toledo Human Subjects Research Committee. Participation in the study was voluntary.

Summary

Chapter 3 described the study population, the data instruments, the variables, the research questions proposed, the statistical measurements planned, the validation and limitations of this study of 75 percent of the 12 associate degree emergency medical technology programs located in public two-year community or technical colleges in the United States, which participated in an investigation of the costs of the technical core curriculum component for the academic years 1989-90, 1990-91, and 1991-92.

CHAPTER 4

ANALYSIS AND FINDINGS

The collection, analysis and reporting of program expenditures for the years 1989-90, 1990-91, and 1991-92 from a population of CAHEA accredited associate degree emergency medical technician-paramedic education programs in selected two-year public community and technical colleges was conducted to address the research questions. The population consisted of CAHEA accredited associate degree emergency medical technician-paramedic education programs in selected two-year public community and technical colleges located in states that require the National Registry of Emergency Medical Technician-Advanced Level Examination for certification as an Emergency Medical Technician-Paramedic.

The data collected were analyzed and compared using descriptive statistics and correlation procedures. Frequency distributions, percentages, means and correlations resulted from the analysis of the data. The Pearson product-moment correlation procedure was used to indicate the relationship between the variables posed in the research questions. The interpretation of the size of the correlation coefficient followed the guidelines established by Hinkle, Wiersma, and Jurs (1988).

The data were collected using a program cost model, based on the Gonyea model (1973) and adapted for emergency medical technology programs. The Emergency Medical Technology Program Cost Questionnaire was pilot tested prior to its distribution to the selected programs. Changes were made as a result of the pilot test that increased ease of completion and improved the clarity of the questions. Changes were made, as suggested by the reviewers, in the questions regarding student to faculty ratios to increase clarity.

The dependent variables examined were the cost per student contact hour of instruction and the first time pass rate of graduates on the National Registry of Emergency Medical Technicians-Advanced Level written examination. The cost per student contact hour of the technical core curriculum was based on information supplied by the program directors for the academic years 1989-90, 1990-91, and 1991-92 on The Emergency Medical Technology Program Cost Questionnaire.

There were two independent variables. They were: (a) The Instructional Contact Hours of the number of student contact hours in the technical curriculum, in the technical lectures, in the technical laboratories, and in the directed clinical and field internship experiences, (b) Program Characteristics of total student enrollment, number of faculty, faculty compensation, length of time the program had been in operation, and attrition rates.

The results of the comparisons and analyses of data are presented in five sections:

Section one includes institutional data; of total head count enrollment in the community or technical colleges and the location of the community or technical college (urban or rural).

Section two is the technical core curriculum data; regarding enrollment and the number of years a program had been in operation, the number of graduates from each program for each year studied, and the first time pass rates of the graduates on the written section of the National Registry Advanced Level examination.

Section three contains curriculum data; including the number of didactic contact hours, the number of laboratory contact hours, the number of clinical contact hours, the number of ALS mobile unit clinical contact hours, the faculty to student ratio for on-campus laboratory instruction, the percentage of the total instructional contact hours in each area of instruction, and the total number of contact hours in the program.

Section four is the college faculty staffing data; including the total number of full-time faculty, the total number of part-time faculty, the average salary of the full-time faculty, and the average yearly expenditures for part-time faculty salaries.

Section five contains program cost factors; the average percentage of salary for fringe benefits for both part and full-time faculty, the average payment received by clinical preceptors, the number of clinical sites, the cost per year for secretarial services, instructional supplies, travel expenses, equipment, and communication supplies per year.

Twelve programs of the 73 CAHEA accredited programs in the United States that graduated students in the academic years 1989-90, 1990-91, and 1991-92 in the United States fulfilled all three of the study eligibility criteria. The criteria were that the program be in a public two-year community or technical college, located in a state which required successful completion of the NREMT-Advanced examination, and which was accredited by CAHEA. The programs were located in Alabama, New Hampshire, Ohio, Washington, and Mississippi.

Nine (75%) of the twelve program directors who were sent the study questionnaire returned completed questionnaires. One of the original program directors who declined to participate in the study stated, "the information was not known". Only two of the nine respondents (22%) were able to report the cost for the initial year of program operation.

Follow-up phone conversations with the seven program directors who were unable to provide initial year of operation cost data revealed that the directors were not involved in the initial year of program operation. Files on the costs associated with the initial year were not available (personal communications, July 1993). Therefore, the research questions pertaining to initial year costs of program operation could not be addressed.

The cost per student contact hour in the technical core curriculum of emergency medical technician-paramedic education programs in selected two-year public community and technical colleges was computed by summarizing all the expenditure totals for each of the academic years 1989-90, 1990-91, and 1991-92 from the completed program cost forms for emergency medical technology education programs and dividing the average total yearly expenditures by the average total student contact hours of instruction in the technical core curriculum. The total average cost for each of the categories of program expenditures was obtained by averaging the cost for each of the academic years 1989-90, 1990-91, and 1991-92.

The emergency medical technology program coded number 20 consistently reported expenditures and attrition rates that were two, and in some instances, three times greater than the expenditures reported by the other emergency medical technology programs that responded to the study. Therefore, the analysis of data in the categories of yearly expenditures and attrition rates was conducted both including and excluding program 20.

Total average yearly expenditures for the nine emergency medical technology programs included in the study academic years 1989-90, 1990-91, and 1991-92 ranged from $46,017.00 to $320,233.00. The average yearly expenditure was $101,033.00. The data for each institution are contained in Table 1.

Table 1

Yearly Total Program Expenditures
and Total Program Expenditures

Program Code	Dollars 1989-90	1990-91	1991-92	Average
1	$108,900	$112,300	$121,000	$113,767
2	100,300	108,400	94,400	101,033
3	184,000	215,630	208,635	202,750
4	181,824	140,335	146,438	156,199
11	87, 695	101,081	108,556	99,111
13	49,000	44,600	57,800	50,466
15	52,000	52,100	56,300	53,466
20	284,000	327,200	349,500	320,233
21	37,500	59,300	41,250	46,016

The total average student contact hours of instruction in the technical core curriculum for the nine emergency medical technology programs included in the study for the academic years 1989-90, 1990-91, and 1991-92 ranged from 656 contact hours of instruction to 1,573 contact hours of instruction. The median total average student contact hours of instruction was 1,094 hours. Data by institution are contained in Table 2.

The average cost per student contact hour of instruction in the technical core curriculum for the nine emergency medical technology programs included in the study for the academic years 1989-90, 1990-91, and 1991-92 ranged from $38.12 per contact hour of instruction to $345.08 per contact hour of instruction. The median average cost per student contact hour of instruction in the technical core curriculum was $83.35 per hour. Data by institution are contained in Table 3.

Table 2

Yearly Average Student Contact Hours
in Technical Core Curriculum and
Average Student Contact Hours

Program Code	1989-90	1990-91	1991-92	Average
1	1,376	1,368	1,352	1,365
2	1,145	1,315	1,315	1,258
3	1,032	1,032	1,032	1,032
4	1,573	1,573	1,573	1,573
11	1,162	1,158	1,149	1,156
13	1,240	1,352	1,380	1,324
15	656	656	656	656
20	928	928	928	928
21	603	675	935	738

Table 3

Yearly Average Cost per Student Contact Hour
in Technical Core Curriculum and Average
Cost per Student Contact Hour

Program Code	1989-90	1990-91	1991-92	Average
1	$ 79.14	$ 82.09	$ 88.82	$ 83.35
2	87.60	82.43	71.79	80.31
3	178.29	208.94	202.16	196.47
4	115.59	89.21	93.09	99.30
11	75.47	87.29	94.48	85.07
13	39.52	32.99	41.88	38.12
15	79.27	79.42	85.82	81.50
20	306.03	352.59	376.62	345.08
21	62.19	87.85	44.15	62.35

Section 1. Analysis of Institutional Characteristics

Institutional headcount enrollment

The nine public two-year institutions, which responded for this study, had total headcount enrollments for the academic year 1989-90 ranging from 783 to 11,038 students (1990 Higher Education Directory, 1990). The average enrollment for all institutions for the academic year 1989-90 was 4,417; the median enrollment was 3,788. Total headcount enrollments for the nine public two-year institutions for the academic year 1990-91 ranged from 745 to 12,671 students (1991 Higher Education Directory, 1991). The average enrollment for all institutions for the academic year 1990-91 was 4,925; the median enrollment was 4,126. Total headcount enrollments for the nine public two-year institutions for the academic year 1991-92 ranged from 962 to 12,683 students (1992 Higher Education Directory, 1992). The average enrollment for all institutions for the academic year 1991-92 was 5,045; median enrollment was 4,566.

The average cost per student contact hour in the technical core curriculum of the emergency medical technology program ranged from $38.12 to $345.08. A display of the cost per student contact hour of instruction and the institutional head count enrollment is found in Table 4. Analysis of institutional head count enrollment and the cost per student contact hour of instruction revealed little, if any, correlation ($r=-.15$).

Rural or urban location of the community college.

All nine colleges which responded were located within a Metropolitan Statistical Area as designated by the United States Office of Management and Budget (NCES, 1991). Therefore, no analysis or comparisons were able to be conducted on this variable because none were designated as being in a rural area.

Table 4

Average Cost per Student Contact Hour of Instruction
and the Total Head Count Enrollment

Program Code	Total Average Institutional Head Count Enrollment	Program Total Average Cost per Hour of Instruction
1	6,240	$ 83.35
2	838	80.31
3	6,097	196.47
4	2,883	99.30
11	2,446	85.07
13	12,131	38.12
15	4,381	81.50
20	4,115	345.08
21	4,026	62.35
		r=-.15

Section 2. Analysis of Program Characteristics

Program headcount enrollment

Eight of the nine emergency medical technology programs that responded to this study, reported enrollment data. These eight programs reported headcount enrollments for the academic year 1989-90 ranging from 10 to 48 students. The average enrollment for the programs for the academic year 1990 was 23.6; the median enrollment was 24. Headcount enrollments for the emergency medical technology programs, for the academic year 1990-91, ranged from 12 to 57 students. The average enrollment for all programs for the academic year 1990-91 was 28; the median enrollment was 22. Headcount enrollments for the emergency medical technology programs, for the academic year

1991-92, ranged from 55 to 65 students. The average enrollment for all programs for the academic year 1991-92 was 31.75; median enrollment was 28.5. These data are presented in Table 5.

Table 5

Yearly Head Count Enrollment in the Technical Core Curriculum

Program Code	1989-90	1990-91	1991-92	Average
1	24	24	24	24
2	34	35	31	33
3	48	42	45	45
11	24	22	26	24
13	10	12	15	12
15	20	22	33	25
20	48	57	65	56
21	10	10	15	12

The average cost per student contact hour in the technical core curriculum of the emergency medical technology program ranged from $38.12 to $345.08. A comparison of program expenditures per student contact hour of instruction and the program head count enrollment are displayed in Table 6. Analysis of the cost per student contact hour of instruction to head count enrollment in the nine emergency medical technology programs revealed a very high positive correlation to the cost per student contact hour of instruction (r=.92).

Table 6

Average Cost per Student Contact Hour of Instruction and the Average Program Head Count Enrollment

Program Code	Average Head Count Enrollment	Program Total Average Cost per Hour of Instruction
1	24.00	$ 83.35
2	33.30	80.31
3	45.00	196.47
11	24.00	85.07
13	12.30	38.12
15	25.00	81.50
20	56.70	345.08
21	12.30	62.35
		r=.92

Length of time programs were in operation

The number of years the nine associate degree emergency medical technology programs included in the study had been in operation ranged from 4 to 19 years as of 1993, when data were collected. The average number of years the programs had been in operation was 12.3; the median number of years was 15. Five programs had been in operation for fifteen or more years. Programs in existence for fifteen or more years ranged in cost per student contact hour for the technical core curriculum of the emergency medical technology program from $85.73 to $345.08. Programs in existence for less than fifteen years ranged in cost per student contact hour for the technical core curriculum from $38.12 to $80.60. The most expensive program, at $345.08 per student contact hour of instruction, had been in existence for fifteen years; the least expensive program, at $38.12 per student contact hour of instruction, had been in existence for four years. A higher cost per student contact hour of instruction existed in programs that had been in existence for fifteen or more years. A low positive correlation existed (r=.41) between age of program in years and cost per student contact hour. These data are displayed in Table 7.

Table 7

Age of Program and Average Cost per Student Contact Hour of Instruction

Program Code	Age in Years	Total Program Average Cost per Hour of Instruction
1	19	$ 83.35
2	13	80.31
3	16	196.47
4	16	99.30
11	15	85.07
13	4	38.12
15	4	81.50
20	15	345.08
21	4	62.35
		r=.41

Attrition rates based on number of students admitted and number of students graduated.

The attrition rate for students enrolled in the technical core curriculum of the emergency medical technology programs was calculated for each of the eight programs in the study that reported enrollment data for this item for the academic years 1989-90, 1990-91, and 1991-92 and is displayed in Table 8. The technical core curriculum instruction was completed in one academic year in all nine emergency medical technology programs included in the study. Attrition rates were calculated by subtracting the reported number of graduates per year from the number of students admitted to the technical core curriculum at the beginning of the same year and dividing the number not graduated by the number admitted and multiplying the results by 100.

Attrition rates for the academic year 1989-90 ranged from zero percent to 69 percent. The average attrition rate for the eight programs that reported enrollment data in the study for the academic year 1989-90 was 26.6 percent. Attrition rates for the programs in the academic year 1990-91 ranged from 14 percent to a high of 68 percent. The average attrition rate for the programs for the academic year 1990-91 was 33 percent. Attrition rates for the programs in the academic year 1991-92 ranged from 13 percent to 65 percent. The average attrition rate for all programs for the academic year 1991-92 was 33 percent.

The average attrition rates for the eight emergency medical technology programs for the academic years 1989-90, 1990-91, and 1991-92 ranged from 15 percent to 66 percent. These data are displayed in Table 8. The emergency medical technology program with the highest average total cost per student contact hour of instruction in the technical core curriculum ($345.08), exhibited the highest attrition rate for each of the three years studied as follows; 1989-90, 69 percent; 1990-91, 68 percent; and 1991-92, 65 percent.

The emergency medical technology program with the lowest cost per student contact hour of instruction in the technical core curriculum, ($38.12), experienced the second lowest attrition rate for 1989-90 at 10 percent and 1990-91 at 17 percent, and the lowest attrition rate for 1991-92; 20 percent.

Table 8

Average Yearly Attrition Rates

Program Code	Attrition 1990	Attrition 1991	Attrition 1992
1	17%	21%	33%
2	18	23	23
3	42	38	36
11	37	41	38
13	0	17	2
15	8	14	24
20	69	68	65
21	2	17	13

An analysis of the cost per student contact hour of instruction of the emergency medical technology programs in relation to attrition rates in the technical core curriculum portion of the program demonstrated a very high positive correlation (r=.92). These data are presented in Table 9. When program 20 was excluded from the calculation a high positive correlation existed (r=.71).

First time pass rates of graduates on the written portion of the National Registry Advanced Level examination.

The nine emergency medical technology programs that comprised the population for this study were located in states that required successful completion of the National Registry Advanced Level examination as a prerequisite for certification in the state as an

EMT-P. Graduates of the nine emergency medical technician-paramedic education programs in the study applied to the National Registry of Emergency Medical Technicians to sit for the advanced level examination. Graduates were allowed six attempts, within a one-year period from date of program completion, to pass the examination. Pass rates were used for analysis and comparison in the study and reflected the number of graduates who passed the written segment of the advanced level examination on their first attempt.

Table 9

Average Attrition Rates and Average Cost per Student Contact Hour of Instruction

Program Code	Average Attrition	Total Program Average Cost per Hour of Instruction
1	24%	$ 83.35
2	21	80.60
3	39	196.47
4	N/R	99.30
11	39	85.73
13	16	38.12
15	15	81.50
20	67	345.08
21	16	64.72
		r=.92

The average first time pass rate was calculated for each program for the academic years 1989-90, 1990-91, and 1991-92. The average first time pass rates ranged from 31 percent to 95 percent. The median was 65 percent. These data are contained in Table 10.

Table 10

National Registry Advanced Level Written
Examination First Time Pass Rates

Program Code	First Time Pass Rates
1	95%
2	44
3	44
4	79
11	84
13	53
15	68
20	31
21	65

First Time Pass Rates provided by The National Registry of Emergency Medical Technicians, Columbus, Ohio, 1993.

First time Pass rates and program expenditures

A moderate positive correlation (r=.49) existed between the first time pass rates for graduates and the total program expenditures of the nine emergency medical technology programs. These data are presented in Table 11. However, when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation little, if any, relationship between total program expenditures and first time pass rates existed (r=-.07). The program with the highest average program expenditures ($320,233) had the lowest first time pass rate (31%) for graduates. The program with the lowest average program expenditures ($50,466) had the median (65%) first time pass rate.

Table 11

National Registry Advanced Level Written Examination
First Time Pass Rates and Average
Total Program Expenditures

Program Code	Average First Time Pass Rate	Total Program Average Expenses
1	95%	$113,767
2	44	101,033
3	44	202,753
4	79	156,199
11	84	99,111
13	53	50,466
15	68	53,467
20	31	320,233
21	65	46,017

r=.49

First time pass rates and the cost per student contact hour

An analysis of the first time pass rates for graduates of the nine emergency medical technology programs in relation to the cost per student contact hour of instruction revealed a moderate negative correlation (r=-.60) These data are presented in Table 12. When the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation little, if any, relationship between cost per student contact hour of instruction and first time pass rates existed (r=-.26). The program with the highest cost per student contact hour of instruction ($345.08) had the lowest first time pass rate (31%) for graduates. The program with the lowest cost per student hour of instruction ($38.12) had a first time pass rate (53%), which was below the median (65%) first time pass rate for the nine emergency medical technology programs.

Table 12

National Registry Advanced Level Written Examination
First Time Pass Rates and Average Cost per
Student Contact Hour of Instruction

Program Code	Average First Time Pass Rate	Total Program Average Cost per Hour of Instruction
1	95%	$ 83.35
2	44	80.31
3	44	196.47
4	79	99.30
11	84	85.07
13	53	38.12
15	68	81.50
20	31	345.08
21	65	62.35
		r=-.60

First time pass rates and number of full-time faculty members

The total number of full-time faculty members employed by the nine emergency medical technology programs in the study was 17. Directors of the programs were included in the total count of full-time faculty in the emergency medical technology programs. The number of full-time faculty members in the nine emergency medical technology programs, which responded to this study, ranged from four full-time faculty members to a low of one full-time faculty member for the academic years 1989-90, 1990-91, and 1991-92. The program with the largest number of faculty members (4) had the lowest (31%) first time student pass rate on the National Registry Advanced Level written examination. Two of the four programs with one full-time faculty member ranked above the median first time pass rate on the National Registry examination and one ranked below the median first time pass rate. Analysis of first time pass rates for graduates on the National Registry examination and the number of full-time faculty revealed little, if any, correlation (r=.20). These data are contained in Table 13.

Table 13

National Registry Advanced Level Written Examination
First Time Pass Rates and Average
Number of Full-Time Faculty

Program Code	Average First Time Pass Rate	Average number of Full-Time Faculty
1	95%	2
2	44	2
3	44	2
4	79	3
11	84	1
13	53	1
15	68	1
20	31	4
21	65	1
		r=.20

First time pass rates and average full-time faculty salaries

An analysis of the first time pass rates for graduates of the nine emergency medical technology programs in relation to the average full-time faculty salary was conducted. The average full-time faculty salary was obtained by determining the average total faculty salaries by program for the academic years 1989-90, 1990-91, and 1991-92. The average full-time total faculty salary by program was then divided by the total number of faculty members in each program to produce an average full-time faculty salary on each program for comparison. A low negative correlation (r=-.38) existed between the average full-time faculty salaries and the first time pass rates of the graduates. When the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation little, if any, relationship between average full-time faculty salaries and first time pass rates existed (r=-.19).

The programs with the first and second highest average full-time faculty salaries had, respectively, the first and second lowest first time pass rate for graduates. The program with the lowest average full-time faculty salary had the median first time pass rate. These data are presented in Table 14.

First time pass rates and the number of part-time faculty

The nine emergency medical technology programs which formed the population for this study, had an average of 4.11 part-time faculty members for the academic years 1989-90, 1990-91, and 1991-92. The number of part-time faculty members ranged from 1 to 18. Analysis of first time pass rates for graduates on the National Registry examination to the number of part-time faculty revealed a modest negative correlation (r=-.41). These data are contained in Table 15.

Table 14

National Registry Advanced Level Written Examination
First Time Pass Rates and Average
Full-Time Faculty Salary

Program Code	Average First Time Pass Rate	Average Full-Time Faculty Salary
1	95%	$ 30,133
2	44	42,000
3	44	34,877
4	79	37,184
11	84	33,559
13	53	25,333
15	68	32,733
20	31	40,000
21	65	25,200

r=-.38

Table 15

National Registry Advanced Level Written Examination
First Time Pass Rates and Average
Number of Part-Time Faculty

Program Code	Average First Time Pass Rate	Average number of Part-Time Faculty
1	95%	0
2	44	1
3	44	18
4	79	2
11	84	1
13	53	1
15	68	8
20	31	5
21	65	1

r=-.41

First time pass rates and average yearly expenditures for part-time faculty salaries

Based on data received from the nine emergency medical technology programs for the academic years 1989-90, 1990-91, and 1991-92, part-time faculty employed by the programs in the study received an average hourly pay rate of $19.73. The average part-time hourly pay rate ranged from $13.00 to $41.67.

Average yearly expenditures for part-time faculty salaries ranged from $13,000 to $76,667. A moderate negative correlation (r=-.61) existed between the average yearly expenditures for part-time faculty and the first time pass rates of the graduates. Little, if any, correlation existed between average yearly expenditures for part-time faculty salaries and first time pass rates (r=-.27) when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation. Program code number one reported no part-time faculty employed in the academic years 1989-90, 1990-91, and 1991-92. These data are displayed in Table 16.

First time pass rates and total contact hours of instruction

An analysis of the average total contact hours of instruction in the technical core curriculum for the nine emergency medical technology programs was correlated with the first time pass rates. The average total contact hours in the three categories of instruction; didactic, on-campus laboratory and clinical were also analyzed in relation to first time pass rates. The data are listed in Table 17.

Analysis and comparison of the first time pass rates to total contact hours of instruction demonstrated a low positive correlation (r=.31).

The four programs with average first time pass rates above the median of 65 percent included the program with the highest (1,573 hours) average total instructional hours. Also included in the four programs above the median first time pass rate of 65 percent was the program with the lowest (656) average total instructional hours.

Little, if any, correlation (r=-.10) existed between the average total didactic instructional hours per student to the average first time pass rate for graduates from the nine emergency medical technology program. These data are contained in Table 17.

Eight of the nine emergency medical technology programs in the study reported hours spent in on-campus laboratory instruction. The analysis of the average on-campus laboratory contact hours to average cost per student contact hour demonstrated little, if any, positive correlation (r=.28). These data are displayed in Table 17.

A low positive correlation (r=.42) resulted from the analysis of the average total clinical contact hours per student to the average first time pass rate for graduates. These data are exhibited in Table 17.

Table 16

National Registry Advanced Level Written Examination First Time Pass Rates and Average Part-Time Faculty Salaries

Program Code	Average First Time Pass Rate	Average Expenditures for Part-Time Faculty Salaries
2	44	$13,000
3	44	57,000
4	79	19,805
11	84	24,796
13	53	12,000
15	68	12,000
20	31	76,667
21	65	12,567
		r=-.61

Table 17

National Registry Advanced Level Written Examination
First Time Pass Rates and Average Total Instructional
Didactic, Clinical, and On-Campus Laboratory
Hours in the Technical Core Curriculum

Program Code	Average First Time Pass Rate	Average Total Instructional Hours	Didactic Average Hours	Clinical Average Hours	On-Campus Laboratory Hours
1	95%	1,365	240	925	200
2	44	1,258	594	499	166
3	44	1,032	340	592	100
4	79	1,573	1,168	405	0
11	84	1,165	420	616	120
13	53	1,324	577	490	256
15	68	656	240	320	96
20	31	928	240	508	80
21	65	738	N/R	548	190
		r=.31	r=.10	r=.42	r=.28

All of the nine emergency medical technology programs included in the study used an ALS Mobile Unit for student clinical experience. The total average number of hours spent in an ALS Mobile Unit was 293. Analysis of the average total contact hours on an ALS Mobile unit to the average first time pass rate for graduates produced a moderate positive correlation (r=.58). These data are exhibited in Table 18.

Table 18

National Registry Advanced Level Written Examination
First Time Pass Rates and Total Average ALS
Mobile Unit Clinical Hours in the
Technical Core Curriculum

Program Code	Average First Time Pass Rate	Average ALS Mobile Unit Hours
1	95%	700
2	44	120
3	44	240
4	79	260
11	84	300
13	53	250
15	68	160
20	31	300
21	65	272
		r=.58

Section 3. Analysis of the Technical Core Curriculum Characteristics

Faculty have developed a curriculum for the technical core of CAHEA accredited emergency medical technology programs following the United States Department of Transportation-National Standard Training Curriculum-Paramedic (1985) (USDOT-NSTC-P). Neither the USDOT-NSTC-P nor CAHEA guidelines set minimum hours of instruction. The nine emergency medical technology programs that responded to the study, varied widely in the total number of hours of instruction in their technical core curricula. The average number of hours of instruction for the academic years 1989-90, 1990-91, and 1991-92 in the technical core curriculum ranged from 656 to 1,573. The median hours of instruction was 1,156. The division of instructional hours between lecture and on-campus laboratory contact hours and the number of hours spent in clinical instruction varied widely among the nine emergency medical technology programs, in addition to a wide range in the total number of hours of instruction required in the technical core curriculum. The percent of the total average instructional hours, spent in the classroom setting ranged from 18 percent to 74 percent. Clinical instruction ranged from 24 percent to 74 percent of total instructional time in the technical core curriculum. Eight of the nine programs reported the number of hours used for on-campus laboratory instruction. On-campus laboratory instruction time ranged from 9 percent to 26 percent of total instructional time in the technical core curriculum. Individual institutional data are contained in Table 19.

Table 19

The Percent of Clinical, Didactic, and On-campus Laboratory Contact Hours of the Average Total Instructional Hours

Program Code	Average Clinical Hours	Percent Clinical Hrs. of Total Hours	Average Didactic Hours	Percent Didactic Hrs. of Total Hours	On-Campus Lab Hours	Percent Lab Hrs. of Total Hours	Average Instructional Contact Hours
1	925	68%	240	18%	200	15%	1,365
2	499	40	594	47	166	13	1,259
3	592	57	340	33	100	10	1,032
4	405	26	1,168	74	N/R	N/R	1,573
11	616	53	420	36	120	10	1,156
13	490	37	577	44	256	19	1,323
15	320	49	240	37	96	15	656
20	508	55	340	37	80	9	928
21	548	74	N/R	N/R	190	26	738

Total number of instructional hours

The average number of instructional contact hours in the technical core curriculum for the nine emergency medical technology programs, based on the academic years 1989-90, 1990-91, and 1991-92 ranged from 656 to 1,573 hours. The median average number of instructional contact hours in the technical core curriculum was 1,094. Programs with greater than the median number (1,094) of instructional contact hours included the least expensive program based on the cost per student contact hour. Programs with less than the median number of instructional contact hours included the most expensive program based on the cost per student contact hour.

The analysis of the total instructional contact hours per student and the average cost per student contact hour for the technical core curriculum of the nine emergency medical technology programs demonstrated little, if any, correlation existed (r=-.22). When the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation little, if any, relationship between total instructional hours and cost per student contact hour of instruction existed (r=-.04). These data are displayed in Table 20.

Average didactic contact hours

The average number of didactic contact hours of instruction based on the data submitted by the programs in the study population, ranged from 240 hours to 1,168 hours. The median number of hours of didactic instruction within the technical core curriculum was 380. All didactic hours of instruction in the technical core curriculum for the academic years 1989-90, 1990-91, and 1991-92 were taught by all programs in one calendar year. Programs with greater than the median number of hours of didactic instruction included the least expensive programs based on the cost per student contact hour. Table 20 contains these data.

Table 20

Cost per Student Hour of Instruction and Average Total Instructional Didactic, Clinical, and On-Campus Laboratory Hours in the Technical Core Curriculum

Program Code	Average Total Instructional Hours	Didactic Average Hours	Clinical Average Hours	On-Campus Laboratory Hours	Average Cost per Hour of Instruction
1	1,365	240	925	200	$ 83.35
2	1,258	594	499	166	80.31
3	1,032	340	592	100	196.47
4	1,573	1,168	405	0	99.30
11	1,165	420	616	120	85.07
13	1,324	577	490	256	38.12
15	656	240	320	96	81.50
20	928	240	508	80	345.08
21	738	N/R	548	190	62.35
	r=-.22	r=.23	r=.02	r=.02	

The correlation between the average didactic instructional hours per student and the average cost per student contact hour for the technical core curriculum of the emergency medical technology programs produced a little, if any correlation (r=.23). These data are exhibited in Table 20. When the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation little, if any, relationship between total didactic hours of instruction and cost per student contact hour of instruction existed (r=-.12).

Clinical contact hours

The average number of clinical contact hours of instruction in the technical core curriculum, for the nine emergency medical technology programs included in the study, based on the academic years 1989-90, 1990-91, and 1991-92 ranged from 320 student contact hours to 925 student contact hours. The median number of student contact hours of instruction in a clinical setting was 508. All clinical contact hours of instruction in the technical core curriculum for the academic years 1989-90, 1990-91, and 1991-92 were taught by the programs in one calendar year.

The program with the highest cost per student hour of instruction ($345.08) required 508 clinical contact hours. This number was the median hours of clinical contact hours. The program with the lowest cost per student hour of instruction ($38.12) required greater than the median number of hours of clinical instruction. Little, if any, correlation existed between the average clinical hours of instruction per student and the average cost per student contact hour of instruction in the technical core curriculum (r=.02). When the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation little, if any, relationship between total clinical hours of instruction and cost per student contact hour of instruction existed (r=.10). These data are displayed in Table 20.

Clinical contact hours by area of experience.

Clinical contact hours of instruction varied among the nine emergency medical technology programs. These data are contained in Table 21.

Table 21

The Average Clinical Contact Hours
by Area of Clinical Experience

	Average hours by Academic Year		
Clinical Area	1989-90	1990-91	1991-92
Emergency Department	134.7	139.2	140.7
Anesthesia/Surgery	25.0	28.0	28.3
Coronary Intensive Care	37.0	39.0	37.0
Obstetric Labor/Delivery	18.5	18.5	18.5
Pediatric Unit	17.3	22.7	22.7
Surgical Intensive Care	30.4	26.4	26.4
Psychiatric Unit	10.6	13.4	13.4
ALS Mobile Unit	284.4	284.4	309.4

Eight of the nine emergency medical technology programs included in the study utilized a Coronary Intensive Care Unit for student clinical experience. The average number of hours spent in the Coronary Intensive Care Unit for these eight emergency medical technology programs was 37.67. Programs that required more than the average number of clinical contact hours included the most expensive program based on the cost per student contact hour. Programs that required less than the average number of hours of clinical contact hours included the least expensive program based on the cost per student contact hour. These data are displayed in Table 21.

Eight of the nine emergency medical technology programs included in the study utilized an Anesthesia/Surgery unit for student clinical experience. The average number of hours spent in an Anesthesia/Surgery for these nine programs was 28.25. Five programs required greater than the average number of clinical contact hours including the most expensive program based on the cost per student contact hour. Three programs required less than the average number of clinical contact hours including the least expensive program based on the cost per student contact hour. These data are displayed in Table 21.

Eight of the nine emergency medical technology programs included in the study utilized the Emergency Department for student clinical experience. The average number of hours spent in the Emergency Department of these eight programs was 138.25. Three programs required greater than the average number of clinical contact hours including the most and least expensive programs based on the costs per student contact hour. Five programs required less than the average number of clinical contact hours. These data are displayed in Table 21.

All nine emergency medical technology programs included in the study utilized an Obstetric Labor and Delivery unit for student clinical experience. The average number of hours spent in an Obstetric Labor and Delivery clinical experience was 18.5. The four programs that required greater than the average number of hours of clinical contact hours included the most expensive program based on the cost per student contact hour. The five programs that required less than the median number of hours of clinical contact hours included the least expensive program based on the cost per student contact hour. These data are displayed in Table 21.

Seven of the nine emergency medical technology programs included in the study utilized a Pediatric Unit for student clinical experience. The average number of hours for these seven programs spent in a Pediatric Unit was 21.05. Three programs required greater than the average number of clinical contact hours including the second most expensive program based on the cost per student contact hour. The most expensive program based on the cost per student contact hour did not require a pediatric clinical experience. The four programs that required less than the average number of clinical contact hours in a pediatric unit included the least expensive program based on the cost per student contact hour. These data are displayed in Table 21.

None of the nine emergency medical technology programs included in the study utilized a Phlebotomy Team as a student clinical experience, thus no analysis of this clinical experience was possible.

Six of the nine emergency medical technology programs included in the study utilized a Surgical Intensive Care Unit for student clinical experience. The average number of hours spent in a Surgical Intensive Care Unit for these six programs was 28.73. Three programs required greater than the average number of hours of clinical contact hours including the second most expensive program based on the cost per student contact hour. The most expensive program did not require a surgical intensive care clinical experience. The four programs that required less than the average number of clinical contact hours included the least expensive program based on the cost per student contact hour. These data are displayed in Table 21.

Eight of the nine emergency medical technology programs included in the study utilized a Psychiatric Unit for student clinical experience. The average number of hours spent in a Psychiatric Unit for these eight programs was 13.4. The three programs with greater than the average number of hours of clinical contact hours included both the most and the least expensive program based on the cost per student contact hour. These data are displayed in Table 21.

All nine emergency medical technology programs included in the study utilized an ALS Mobile Unit for student clinical experience. The average number of hours spent in an ALS Mobile Unit was 293. The four programs that required more than the average number of clinical contact hours in the ALS mobile unit included the least expensive program based on the cost per student contact hour. The five programs that required less than the median number of clinical contact hours in the ALS mobile unit hours included the most expensive program based on the cost per student contact hour. These data are displayed in Table 21.

Average on-campus laboratory contact hours

The average total number of on-campus laboratory contact hours of instruction in the technical core curriculum, based on the academic years 1989-90, 1990-91, and 1991-92 submitted by the programs ranged from 80 hours to 260 hours. The median number of hours of on-campus laboratory contact hours of instruction was 143. All on-campus laboratory contact hours of instruction in the technical core curriculum for the academic years 1989-90, 1990-91, and 1991-92 were taught by the programs in one calendar year.

Programs with greater than the median number of hours of on-campus laboratory contact hours included the program with the lowest cost per student contact hour.

Programs with less than the median number of hours of on-campus laboratory contact hours included the program with the highest cost per student contact hour.

The analysis of the average on-campus laboratory instructional hours per student and the average cost per student contact hour for the technical core curriculum demonstrated a moderate negative correlation existed (r=-.68). A moderate negative relationship between total on-campus hours of laboratory instruction and cost per student contact hour of instruction was again demonstrated (r=-.-66) when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation.

The cost per student contact hour for the on-campus laboratory instruction segment of the technical core curriculum of the emergency medical technology program in relation to the faculty to student ratio in the individual programs varied widely. The faculty student ratio ranged from 1:5 to 1:11. The programs with faculty to student ratios greater than 1:5 produced a cost per student contact hour of instruction that included the least expensive program ($38.20) and the most expensive program ($345.08). Two programs had 1:5 faculty to student ratios for on-campus laboratory instruction, and both programs had costs per student contact hour of instruction less than the median ($85.72) for the study population. The analysis of the average faculty to student ratio in on-campus laboratory instruction to the cost per student contact hour of instruction produced a low positive correlation (r=.38). However, when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation, little, if any, correlation was demonstrated (r=-.02). These data are contained in Table 22.

Table 22

Faculty to Student Ratio for On-campus Laboratory Contact Hours and the Cost per Contact Hour of Instruction

Program Code	Faculty to Student Ratio	Total Program Average Cost per Hour of Instruction
1	1:6	$ 83.35
2	1:8	80.31
3	1:8	196.47
4	1:8	99.30
11	1:6	85.07
13	1:11	38.12
15	1:5	81.50
20	1:10	345.08
21	1:5	62.35
		r=.38

The number of clinical sites and the total charges for clinical site usage.

All of the nine emergency medical technology programs in the study utilized both hospital and field sites for clinical instruction. The average number of hospital sites used by the nine programs for the academic years 1989-90, 1990-91, and 1991-92 ranged from two to nine hospital sites. Twenty-six percent to 74 percent of the total instructional contact hours in the technical core curriculum occurred in hospital sites. None of the programs was charged for the use of the hospital sites or the use of hospital employees as clinical preceptors for the emergency medical technology program students.

The comparison and analysis of the average number of hospital sites used in relation to the cost per student contact hour for the technical core curriculum of the nine emergency medical technology programs produced a high positive correlation (r=.84). These data are exhibited in Table 23.

Table 23

The Average Number of Hospital Clinical Sites and the Cost per Contact Hour of Instruction

Program Code	Average Number of Hospital Sites	Total Program Average Cost per Hour of Instruction
1	7	$ 83.35
2	5	80.31
3	9	196.47
4	8	99.30
11	4	85.07
13	3	38.12
15	5	81.50
20	2	345.08
21	3	62.35
		r=.84

All of the nine emergency medical technology programs used field sites for clinical instruction. A field site was defined as, "a mobile advanced life support vehicle where students functioned as a member of the prehospital emergency care team". During the academic years 1989-90, 1990-91, and 1991-92, the average number of field sites used by the nine programs ranged from 1 to 13. None of the programs was charged for the use of the field sites.

The comparison and analysis of the total number of field sites used in relation to the cost per student contact hour for the technical core curriculum of the nine emergency medical technology programs demonstrated little, if any, correlation existed (r=.05). These data are exhibited in Table 24. However, when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation a moderate relationship between total number of number of ALS mobile units used as field sites and the cost per student contact hour of instruction existed (r=.67).

Table 24

The Average Number of ALS Mobile Unit Clinical Sites and the Cost per Contact Hour of Instruction

Program Code	Average Number of ALS Mobile Unit Clinical Sites	Total Program Average Cost per Hour of Instruction
1	13	$ 83.35
2	1	80.31
3	13	196.47
4	9	99.30
11	4	85.07
13	2	38.12
15	5	81.50
20	2	345.08
21	2	62.35
		r=.05

Section 4. Analysis of Faculty Characteristics

Number of full-time faculty

The total number of full-time faculty members employed by the nine emergency medical technology programs in the study was seventeen. Directors of the programs were included in the total count of full-time faculty in the emergency medical technology programs. The number of full-time faculty members in the nine emergency medical technology programs which formed the population for this study, had ranged from four full-time faculty members to the low of one full-time faculty member for the academic years 1989-90, 1990-91, and 1991-92. The program with the highest number of full-time faculty members (4) had the highest cost per student contact hour of instruction $345.08. The four programs with one full-time faculty member were below the median cost ($85.72) per student contact hour of instruction.

A high positive correlation existed (r=.73) between the total number of full-time faculty members and the cost per student contact hour for the technical core curriculum of the nine emergency medical technology programs. These data are exhibited in Table 25.

Average full-time faculty salaries

Full-time individual faculty salaries varied widely among the nine emergency medical technology programs that comprised the population for the study. The average full-time faculty salary was obtained by determining the total faculty salaries for all nine programs for the academic years 1989-90, 1990-91, and 1991-92. The total of full-time faculty salaries was then divided by the total number of faculty members in all programs to produce an average full-time faculty salary for all programs.

The average full-time faculty salary for the academic years 1989-90, 1990-91, and 1991-92, was $33,446.44. The average full-time faculty salary ranged from $25,200 to $42,000 per year. The median full-time faculty salary was $33,000 per year. Eighty-three percent to 34 percent of the average annual expenditures of the nine emergency medical technology programs was spent on full-time faculty salaries. The analysis of the relationship of expenditures for average annual salaries of full-time faculty to the cost per student contact hour of instruction demonstrated a moderate positive correlation (r=.55). These data are presented in Table 26. A moderate positive relationship between average full-time faculty salaries and cost per student contact hour of instruction was again demonstrated (r=.42) when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation.

Table 25

The Average Number of Full-Time Faculty and the Cost per Contact Hour of Instruction

Program Code	Average Number of Full-Time Faculty	Total Program Average Cost per Hour of Instruction
1	2	$ 83.35
2	2	80.31
3	2	196.47
4	3	99.30
11	1	85.07
13	1	38.12
15	1	81.50
20	4	345.08
21	1	62.35
		r=.73

Table 26

The Average Salary for Full-Time Faculty Members and the Cost per Contact Hour of Instruction

Program Code	Average Full-Time Faculty Salary	Total Program Average Cost per Hour of Instruction
1	$30,133	$ 83.35
2	42,000	80.31
3	34,877	196.47
4	37,184	99.30
11	33,559	85.07
13	25,333	38.12
15	32,733	81.50
20	40,000	345.08
21	25,200	62.35
		r=.55

Number of part-time faculty

The nine emergency medical technology programs which responded to this study, had an average of 4.82 part-time faculty members for the academic years 1989-90, 1990-91, and 1991-92. The number of part-time faculty members ranged from 1 to 18. A low positive correlation existed (r=.44) between the average number of part-time faculty members and the cost per student contact hour for the technical core curriculum of the nine emergency medical technology programs. These data are presented in Table 27. However, when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation a high positive correlation between total number of part-time faculty employed by the programs and the cost per student contact hour of instruction was demonstrated (r=.86).

Table 27

The Average Number of Part-Time Faculty and the Cost per Contact Hour of Instruction

Program Code	Average Number of Part-Time Faculty	Total Program Average Cost per Hour of Instruction
1	0	$ 83.35
2	1	80.31
3	18	196.47
4	2	99.30
11	1	85.07
13	1	38.12
15	8	81.50
20	5	345.08
21	1	62.35
		r=.44

Average yearly expenditures for part-time faculty salaries

Based on data received from the nine emergency medical technology programs for the academic years 1989-90, 1990-91, and 1991-92, average yearly expenditures for part-time faculty salaries ranged from $13,000 to $76,667. Average part-time faculty salaries per program comprised between 12 and 27 percent of the total program expenditures for the three years of the study. The analysis of average expenditures for part-time faculty salaries to the cost per student contact hour of instruction revealed a very high positive correlation existed (r=.93). These data are contained in Table 28. A high positive relationship between average yearly expenditures for part-time faculty salaries and cost per student contact hour of instruction was demonstrated (r=.87) when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation.

Table 28

The Average Yearly Expenditures for Part-Time Faculty Salaries and the Cost per Contact Hour of Instruction

Program Code	Average Expenditures for Part-Time Faculty Salaries	Average Cost per Hour of Instruction
2	13,000	$ 80.31
3	57,000	196.47
4	19,805	99.30
11	24,796	85.07
13	12,000	38.12
15	12,000	81.50
20	76,667	345.08
21	12,567	62.35
		r=.93

Section 5. Analysis of Program Cost Characteristics

Average percentage of salary for fringe benefits for full-time and part-time faculty

Five (56%) of the nine emergency medical technology programs included in this study reported fringe benefits for full-time faculty members during the academic years 1989-90, 1990-91, and 1991-92. Four programs (44%) reported their institutions did not calculate fringe benefits as a percentage of full-time faculty members salaries during the academic years 1989-90, 1990-91, and 1991-92. The five programs that reported fringe benefits for the full-time faculty member reported the cost of the fringe benefits as a percentage of total salary. This percentage ranged from 18-35 percent of full-time faculty salaries. These data are displayed in Table 29. Four program directors provided the percentage of full-time faculty salary used to calculate fringe benefits, therefore a correlation was not calculated. None of the nine emergency medical technology programs that responded for this study provided calculated fringe benefits as a percentage of part-time faculty members salaries for the academic years 1989-90, 1990-91, and 1991-92.

Average expenditures for clinical preceptors salaries and/or use of clinical and field sites

None of the nine emergency medical technology programs that responded to this study paid employees of hospitals or ALS mobile units who functioned as clinical preceptors for students enrolled in the technical core curriculum for the academic years 1989-90, 1990-91, and 1991-92. None of the programs was charged a fee for the use of a clinical or field site.

Table 29

Fringe Benefits Calculated as a Percentage of Full-Time Faculty Salary and Cost per Contact Hour of Instruction

Program Code	Calculated Fringe Benefits	Percentage of Salaries	Total Program Average Cost per Hour of Instruction
1	No	0%	$ 83.35
2	Yes	18	80.31
3	No	N/A	196.47
4	Yes	31	99.30
11	Yes	35	85.07
13	No	N/A	38.12
15	Yes	35	81.50
20	Yes	N/R	345.08
21	No	N/A	62.35

Expenditures for support staff

Eight of the nine emergency medical technology programs that responded to the this study completed data regarding expenditures for support staff. One program reported no support staff were available to the program. The average expenditure for support staff salaries based on data from the academic years 1989-90, 1990-91, and 1991-92 was $25,390.65. The median expenditure for support staff was $10,330. The average yearly expenditures for support staff salaries ranged from zero to $76,670.00. These data are displayed in Table 30. The analysis of support staff salaries in relation to the cost per student contact hour of instruction demonstrated a very high positive correlation existed (r=.91). These data are presented in Table 30. When the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation a moderate positive correlation between total expenditures for support staff and cost per student contact hour of instruction existed (r=.61).

Table 30

The Average Yearly Expenditures for Support Staff and the Cost per Contact Hour of Instruction

Program Code	Average Expenditures for Support Staff Salaries	Total Program Average Cost per Hour of Instruction
1	$ 32,333	$ 83.35
2	3,000	80.31
3	29,000	196.47
4	7,467	99.30
11	10,333	85.07
13	2,000	38.12
15	0	81.50
20	76,660	345.08
		r=.91

Expenditures for instructional supplies

The average total yearly expenditures for instructional supplies based on data from the academic years 1989-90, 1990-91, and 1991-92 for the nine emergency medical technology programs which responded to the study was $3,491. The analysis of expenditures for instructional supplies in relation to the cost per student contact hour of instruction demonstrated a low positive correlation existed (r=.31). These data are presented in Table 31. Little, if any, relationship between average yearly expenditures for instructional supplies and cost per student contact hour of instruction existed (r=.15) when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation.

Table 31

The Average Yearly Expenditures for Instructional Supplies and the Cost per Contact Hour of Instruction

Program Code	Average Expenditures for Instructional Supplies	Total Program Average Cost per Hour of Instruction
1	$ 2,000	$ 83.35
2	2,000	80.31
3	6,000	196.47
4	5,000	99.30
11	6,723	85.07
13	1,000	38.12
15	5,000	81.50
20	1,833	345.08
21	1,050	62.35
		r=.31

Expenditures for faculty travel

The nine emergency medical technology programs which responded to this study, had an average total expenditure of $3,491.00 for faculty travel for the academic years 1989-90, 1990-91, and 1991-92. The analysis of expenditures for faculty travel in relation to the cost per student contact hour of instruction demonstrated a low positive correlation existed (r=.33). These data are presented in Table 32. A high positive relationship between average yearly expenditures for faculty travel and cost per student contact hour of instruction was demonstrated (r=.78) when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation.

Table 32

The Average Yearly Expenditures for Faculty Travel and the Cost per Contact Hour of Instruction

Program Code	Average Expenditures for Faculty Travel	Total Program Average Cost per Hour of Instruction
1	$ 467	$ 83.35
2	500	80.31
3	9,000	196.47
4	100	99.30
11	592	85.07
13	1,000	38.12
15	567	81.50
20	1,833	345.08
21	100	62.35
		r=.33

Expenditures for communication and communications supplies

The nine emergency medical technology programs which responded to this study, spent an average of $1,429.00 for communication and communications supplies for the academic years 1989-90, 1990-91, and 1991-92. The analysis of expenditures for communications and communication supplies in relation to the cost per student contact hour of instruction demonstrated a low positive correlation existed (r=.31). These data are presented in Table 33. A moderate positive relationship between average yearly expenditures for communications and communication supplies and cost per student contact hour of instruction was demonstrated (r=.63) when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation.

Table 33

The Average Yearly Expenditures for Communications and the Cost per Contact Hour of Instruction

Program Code	Average Expenditures for Communications	Total Program Average Cost per Hour of Instruction
1	$ 0	$ 83.35
2	367	80.31
3	5,000	196.47
4	0	99.30
11	1,760	85.07
13	133	38.12
15	5,000	81.50
20	1,733	345.08
21	100	62.35
		r=.31

Expenditures for Equipment

An average of $6,515.00 was spent for training equipment by the nine emergency medical technology programs which responded to this study, based on data reported for the academic years 1989-90, 1990-91, and 1991-92. The analysis of the relationship between expenditures for training equipment and the cost per student contact hour of instruction demonstrated little, if any, correlation existed (r=.13). These data are presented in Table 34.

Table 34

The Average Yearly Expenditures for Equipment and the Cost per Contact Hour of Instruction

Program Code	Average Expenditures for Equipment	Total Program Average Cost per Hour of Instruction
1	$ 3,633	$ 83.35
2	2,500	80.31
3	27,000	196.47
4	0	99.30
11	10,333	85.07
13	11,000	38.12
15	2,667	81.50
20	1,500	345.08
21	0	62.35
		r=.13

Summary

The analyses identified cost factors and their effect on the cost per student contact hour for the technical core curriculum of nine emergency medical technology programs located in two-year public colleges in the United States. Data were gathered for the academic years 1989-90, 1990-91, and 1991-92. The results of the analyses provided answers for the research questions which were designed to examine the relationship between cost per student contact hour and institutional data, program data, and curriculum data.

Average total institutional head count enrollment was analyzed as a variable in relation to the cost per student contact hour for the technical core curriculum of the emergency medical technology program. The institutional headcount enrollment demonstrated a low negative correlation to the cost per student contact hour (r=-.15). All of the institutions included in the study were located within Metropolitan Statistical Areas; therefore an analysis of location of college in relation to the cost per student contact hour for the technical core curriculum of the emergency medical technology program was not conducted.

Research questions required answers based on program characteristics and the cost per student contact hour for the technical core curriculum of the emergency medical technology program. Program data examined included; program head count enrollment, number of years the program had been in operation, the attrition rate for each year studied, and the first time pass rates of the graduates on the written section of the National Registry Advanced Level examination. Program data which were correlated with the cost per student contact hour for the technical core curriculum of the emergency medical technology program included; program attrition rate (r=.92), total head count enrollment in the program (r=.92), years the program had been in existence (r=.41), and the first time pass rate on National Registry examinations (r=.49).

Research questions required answers based on the characteristics of the technical core curriculum of the emergency medical technology program and the cost per student contact hour of instruction. The data regarding the technical core curriculum characteristics were; the number of didactic contact hours, the number of on-campus laboratory contact hours, the number of clinical contact hours, the number of hospital sites used for clinical training, the number of field sites used for clinical training, the total number of instructional hours in the technical core curriculum, and the first time pass rates of graduates on the National Registry Advanced Level examination.

Data that had a relationship to the cost per student contact hour for the technical core curriculum of the emergency medical technology program were the total number of didactic contact hours (r=.23), the total number of on-campus laboratory contact hours (r=-.68), the total instructional contact hours (r=-.22), and the number of clinical sites used for clinical instruction (r=.84). Analysis of the data demonstrated little if any relationship between the number of ALS mobile units used as clinical sites to the cost per student contact hour of instruction (r=.05), however, when the program with the highest cost per student hour of instruction ($345.08) was excluded from the calculation a moderate relationship between total number of field sites and the cost per student contact hour of instruction emerged (r=.67).

A second group of research questions explored the cost per student contact hour for the technical core curriculum of the emergency medical technology program as affected by faculty data. The data obtained were; the total number of full-time faculty, the total number of part-time faculty, the average salary of the full-time faculty, and the average pay rate per contact hour received by part-time faculty. Variables and their relationships to the cost per student contact hour for the technical core curriculum of the emergency medical technology program were the total number of full-time faculty (r=.72), average salary of full-time faculty (r=.55), the average number of part-time faculty members (r=.44), and the average yearly expenditures for part-time faculty salaries (r=.93).

A third group of research questions required answers based on the cost per student contact hour for the technical core curriculum of the emergency medical technology program and program cost factors of average percent of salary for fringe benefits for both part and full-time faculty, the average payment received by clinical preceptors, the cost per year for support services, the instructional supplies, travel expenses, and communication equipment. The nine programs in the study did not reimburse clinical preceptors for clinical instruction or supervision. Variables and their relationships to the cost per student contact hour for the technical core curriculum of the emergency medical technology program were the expenditures for support staff (r=.91), the expenditures for instructional supplies (r=.31), the expenditures for training equipment (r=.13), the expenditures for faculty travel (r=.33), and the expenditures for communications and communication supplies (r=.31). When the Pearson product moment correlation was recalculated excluding the program with the highest cost per student hour of instruction ($345.08) a stronger relationship existed between the cost per student contact hour of instruction and the average yearly expenditures for training equipment (r=.72), faculty travel (r=.78) and communications (r=.63).

A fourth group of research questions investigated the relationship between institutional, program, and faculty data in relation to the first time pass rates on the National Registry Advanced Level examination for program graduates. The correlations for the first time pass rates of the graduates on the National Registry Advanced Level examination and the total instructional contact hours (r=.31), the total number of clinical hours of instruction (r=.42), the total number of contact hours in an ALS mobile unit clinical experience (r=.58), and the total expenditures of the program (r=.49) were as indicated. Little, if any, correlation was demonstrated between the first time pass rates of the graduates on the National Registry Advanced Level examination and the total number of didactic contact hours (r=.10), and the total number of on-campus laboratory contact hours (r=.28).

Data supported the existence of an inverse relationship between first time pass rates of graduates on the National Registry Advanced Level examination and the average salary of full-time faculty (r=-.38), the average number of part-time faculty members (r=-.41), and the average yearly expenditures for part-time faculty salaries (r=.-61). Analysis of the data produced little, if any, correlation between first time pass rates of graduates on the National Registry Advanced Level examination and the total number of full-time faculty (r=.20).

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Chapter 1 contained an introduction, a first statement of a problem, and the purpose of the study. The relevant literature pertaining to the problem was reviewed and presented in Chapter 2. A description of the research methodology was presented in Chapter 3. Chapter 4 contained the analyses and findings of the study. This chapter includes a summary of the findings, a presentation of the conclusions drawn from the study, and the recommendations based on this study.

Summary

The development of a new allied health professional; the Emergency Medical Technician-Paramedic (EMT-P) was an outgrowth of the Emergency Medical Services Act of 1966. Subsequently, educational programs proliferated to meet the need for professionals to function as EMT-Ps. Specific criteria for accreditation of EMT-P educational programs have been developed both at the state and national level. The American Medical Association Committee on Allied Health Education and Accreditation (CAHEA) established accreditation standards for Advanced Emergency Medical Technicians (EMTs) educational programs in 1978. Seventy-five of the nation's approximately 500 operating paramedic education programs were CAHEA accredited programs in 1992.

Educational requirements for EMT-Ps expanded rapidly as curriculum content was modified to reflect the extensive changes in medical technology that took place over the past two decades. An increase in the complexity and content of the EMT-P curriculum occurred as emergency medical technology educators attempted to prepare students to function in the changing and challenging prehospital emergency care setting. These changes in the curricula of emergency medical technology educational programs resulted in a movement of programs from their original training sites in emergency departments of community hospitals to classrooms and laboratories of universities and community colleges.

A community benefits from having access to the services of skilled emergency medical technician-paramedics (EMT-P) capable of providing emergency medical interventions outside the traditional hospital setting (Bergner, 1983; Cummins, 1984; Cummins, 1989; Eisenberg, et al., 1989; Eisenberg, et al., 1990; Weaver, 1986). Educationally well prepared emergency medical technicians will be needed in increasing numbers to deliver the sophisticated emergency medical technology of tomorrow and manage emergency health care delivery systems. However, the technical education required to prepare students to assume these roles is costly.

Emergency medical services and educational institutions that produced emergency medical technicians felt the impact of steadily decreasing federal funding for health care delivery and education of health care professions. The trend toward closure of financially ailing community hospitals continues. Emergency medical technicians will be required to transport critically ill patients for considerable distances. The emergency medical technician of the future will require a higher level of education, advanced technical skills, and diverse clinical competencies to care for critically ill patients. These needs will add to the cost of emergency medical technology education programs. The rapidly increasing cost of health care is an issue of national concern. Any factor that increases the cost of educating a health care provider should be evaluated carefully.

Large scale cost studies of health professions, in particular those of medicine and nursing, have been undertaken and funded by professional organizations as well as the federal government. Studies have also been conducted, that have examined the costs associated with nursing and allied health educational programs (Bowen, 1980; Brown, 1980; Harper, 1973; and U.S. Department of Health and Human Services, 1986). The costs of developing and maintaining the technical curriculum of emergency medical technician-paramedic programs have not been studied. A national survey revealed that directors of state emergency medical services agencies in twenty-four states were unable to provide an average cost for emergency medical technician-paramedic educational programs (Ornato, 1988).

The problem addressed in this study was the void in data and information concerning specific factors related to the direct departmental costs associated with the technical core curriculum of selected emergency medical technology programs located in public two-year community or technical colleges for the academic years 1989-90, 1990-91, and 1991-92. The study specifically focused on an analysis of expenditures per student contact hour of instruction in the technical core curriculum of 9 emergency medical technology programs in the United States that were accredited by CAHEA and located in states that required successful completion of the National Registry of Emergency Medical Technicians-Advanced level examination prior to certification to practice as an EMT-P. All 9 programs had their students complete the technical core curriculum in one calendar year or less and each offered instruction in the traditional methods of didactic, on-campus laboratory and off-campus clinical sites and field internships.

The limitations of this study included the limited number (12) EMT-P educational programs in public two-year community colleges in the United States accredited by CAHEA and located in states that require the National Registry of Emergency Medical Technicians-Advanced level examination for certification as an Emergency Medical Technician-Paramedic. No attempt was made to collect, analyze, or compare costs of the associate degree emergency medical technology programs other than those direct departmental expenditures associated with the technical core curriculum component. Neither was any attempt made to compare or analyze direct departmental expenditures associated with the technical core curriculum other than for the research questions posed; nor were the data interpreted as to their influence on other types of emergency medical technology education programs than those participating in this study. Nine of the 12 responded with data that could be used in the analysis of some of the research questions (75% response). Eight provided usable data for all but one of the questions (67% response) and seven returned usable responses for all of the questions (58.1% response).

Factors that were assumed to affect the cost per student contact hour of instruction in the technical core curriculum component of the emergency medical technology programs investigated were divided into five categories. The first was Institutional Characteristics. These were total head count enrollment in the community or technical college and the location of the community or technical college (urban or rural).

Program Characteristics was the second section. This included the enrollment in the technical core curriculum, the number of years the program had been in operation, the number of graduates from each program for each year studied, and the first time pass rate of the graduates on the written section of the National Registry Advanced Level examination.

Technical Core Curriculum Characteristics was the third section. This examined the effect on the cost per student contact hour of instruction, these included the number of didactic contact hours, the number of laboratory contact hours, the number of clinical contact hours, the number of field internship contact hours, the faculty to student ratio for didactic instruction, the faculty to student ratio for on-campus laboratory instruction, the preceptor to student ratio for clinical instruction, the percentage of the total instructional contact hours in each area of instruction, and the total number of contact hours in the program.

College Faculty Staffing characteristics comprised the fourth group of factors and included the total number of full-time faculty, the total number of part-time faculty, the average salary of the full-time faculty, and the average pay rate per contact hour received by part-time faculty.

The fifth section examined Program Cost Characteristics which included the average percentage of salary for fringe benefits for both part and full-time faculty, the average payment received by clinical preceptors, the number of clinical sites, the costs per year for secretarial services, the instructional supplies, travel expenses, and communication equipment per year.

Conclusions

The purpose of this investigation was to survey, analyze, and report direct departmental costs associated with the technical core curriculum of EMT-P educational programs in nine associate degree emergency medical technology programs offered by public two-year community colleges in the United States for the academic years 1989-90, 1990-91, and 1991-92.

The technical core curriculum was the coursework within the two-year associate degree plan of study that prepared the student to function as an EMT-P and was comprised of the United States Department of Transportation National Standard Training Curriculum-Paramedic (USDOT-NSTC-P, 1985). The nine associate degree medical technology programs were accredited by the Joint Review Committee for Educational Programs for Emergency Medical Technician-Paramedic (JRC/EMT-P), a subcommittee of the Committee on Allied Health Education and Accreditation (CAHEA). The nine programs were located in states that required successful completion of the National Registry of Emergency Medical Technicians (NREMT) Advanced Level written and practical examinations as a prerequisite to state certification as an EMT-P.

It is concluded that CAHEA accreditation status for the program did not produce a consistency in the total number of instructional hours spent in the technical core curriculum, nor the number of instructional hours spent in each category of instruction among the nine programs in the study as had been anticipated by the researcher. A wide range of hours of instruction, clinical sites used for student experience, number of full-time faculty, and the first time pass rates for graduates existed among the nine programs studied.

It is also concluded that the requirement for all graduates from the nine programs investigated to successfully complete the National Registry Advanced Level examination to be certified by the state had not produced a consistency in the number of instructional hours, length, or cost of the program as had been anticipated by the researcher.

It is concluded that high attrition rates from the technical core of the emergency medical technology programs had the most consistent effect of increasing the cost per student contact hour of all the independent variables considered in the study.

It is further concluded that the total number of hours of instruction and the instructional methods used had little, if any effect on the cost per student contact hour or the pass rates of the program graduates on a national certifying examination. An exception to this finding was the number of hours spent in on-campus laboratory instruction was inversely related to the cost per student contact hour of instruction.

It is concluded that the number of hospital clinical sites and the number of ALS Mobile Unit clinical sites used by the program for clinical instruction did effect the cost per student hour of instruction. As the number of sites increased, an increase in cost per student contact hour of instruction occurred.

It is also concluded that there was little, if any, relationship between the expenditures for full- or part-time faculty salaries and the first time pass rates of graduates on the national certifying examination. However, first time pass rates did increase as the number of part time faculty members employed by the program increased.

It is concluded that neither the total program expenditures nor the total number of instructional hours in the technical core curriculum influenced the pass rate of the graduates on the National Registry of Emergency Medical Technicians-Advanced level written examination.

During the last several decades, a number of models have been developed for determining costs in health education and to assist in allocating resources within educational institutions (Bowen, 1980; Brown, 1980; Gonyea and Harper, 1978; Harper, 1977; Snider, 1989). This study used a modification of the Gonyea cost construction model to compute the cost per student contact hour of instruction in the technical core curriculum based on the direct departmental costs of selected emergency medical technology programs located in public two-year community or technical colleges. Models for determining costs of health education are based on the availability and the opportunity to obtain program cost data. The computations of the cost per student contact hour of instruction investigated in this study would have been more accurate had program directors had better access to department budget and archival budget records.

Recommendations

The recommendations resulting from this study are presented for consideration by the program directors and faculty members of the emergency medical technology programs investigated. The recommendations are also presented for those in the professional accreditation and professional credentialing organizations in the field of emergency medical technology who have a specific interest in the cost and development of emergency medical technician technical core curricula in the two-year public college setting.

The 1990s is a decade projected to include "a comprehensive overhaul of the nation's health care system" (O'Neil, 1993). The message being sent from the national government administration to health care providers and health care educators is clear:

> "Business as usual is over. The nation now spends more than $25 billion a year to support health professions education, an expenditure that will inevitably be reconsidered as the existing health care system is scrutinized for ways to cut spending and improve efficiency" (O'Neil, 1993).

The following recommendations are offered for program directors and faculty members of emergency medical technology programs, and for persons involved in the accreditation process for emergency medical technology programs and credentialing of emergency medical technicians-paramedics:

1. Program directors should become more knowledgeable about the financing of higher education programs in general and the financing of emergency medical technology programs specifically.
2. Program directors and faculty members should review and evaluate the number of hours required in didactic, on-campus laboratory and clinical areas within the technical core curriculum. The wide variation in number of hours in the technical core curriculum and their inverse relationship to the cost per student contact hour as well as their weak relationship to first time pass rates on the National Registry Advanced level written examination should be carefully evaluated.
3. Program directors and faculty members should review the total number of part-time and full-time faculty positions in the emergency medical technology program, bearing in mind the strong

relationship between numbers of faculty and costs, and the weak relationship between number of full-time faculty and first time pass rates on the National Registry Advanced level written examination.

4. Program directors and faculty members should examine the complexity of the total relationship of expenditures for both full and part-time faculty members' salaries and the cost per student contact hour of instruction and the first time pass rates on the National Registry Advanced Level written examination.

5. Program directors and faculty members should investigate methods to increase student retention in the programs in the study. Consideration should be given to the appropriateness of entrance requirements for applicants to an emergency medical technology program.

6. Program directors and faculty members should consider creative and innovative methods to decrease the cost per student contact hour of instruction in view of the inverse relationship demonstrated by this variable to first time pass rates on the National Registry Advanced level written examination.

7. Program directors and faculty members should consider the effect the possible initiation of user fees for hospital and clinical sites would produce on the cost per student contact hour. Hospital administrators may consider user fees as a means to recoup revenue lost from steadily decreasing federal funding for hospital based health profession education programs.

Recommendations for Additional Study

The final recommendations offered are related to subjects for future studies. Studies should be conducted to,

1. determine the effect of CAHEA accreditation status on emergency medical technology programs in relation to consistency in curriculum design, faculty staffing patterns, and clinical education of students.
2. determine the effect of required successful completion of the National Registry Examination on curriculum design, faculty staffing patterns, and clinical education of students.
3. conduct cost studies of emergency medical technology programs that do not require successful completion of the National Registry Examination and are not accredited by CAHEA and comparatively review program expenditures using the Emergency Medical Technology Program Cost Questionnaire.
4. determine the causes for the wide range of faculty salaries within the CAHEA accredited emergency medical technology programs.
5. determine the cost effectiveness of emergency medical technology programs in relation to other types of allied health professions educational programs.

Appendix I

February 16, 1993

1 ~

Dear 2 ~ :

Currently, I am a doctoral candidate in the College of Education at the University of Toledo majoring in higher education administration. The research proposal I plan to pursue is an analysis of the technical curriculum program costs of emergency medical technician-paramedic education programs accredited by CAHEA in two year colleges in the United States.

The programs selected for the study are located in states that require successful completion of the National Registry Advanced Level examination for certification as an EMT-P. The cost component is for the initial year of the program and for the academic years 1989-90, 1990-91, and 1991-1992.

You are invited to participate in this research project. To participate you will only need to fill out the attached questionnaire. There will be complete privacy of the information you supply. You are free to choose to participate or not participate, and you may stop your participation at any time. By completing this questionnaire, you are giving your consent to participate in the project.

The enclosed questionnaire is adapted from a model used to analyze the costs of other allied health education programs. The questionnaire should take about ½ hour of your time. I will be available to assist you if you consider it necessary. Please call me at the number listed below if you have any questions. I would like to have the questionnaire returned by February 28, 1993. No program will be identified other than through the code number known to you and the researcher. Complete confidentiality is assured.

As you undoubtedly are aware, no research studies have been done by the profession in the area of emergency medical technology curriculum education costs within associate degree programs. The results of this study should prove useful to our profession in the areas of program planning and budgeting. The findings of the study will be forwarded to you for your use in program planning. Thank you for your cooperation and assistance.

Sincerely yours,

Judith A. Ruple, R.N., M.Ed.
Assistant Professor
Director, Emergency Medical Technology Program
The University of Toledo
Toledo, OH 43606
Phone: (419) 537-3195 or (419) 865-5953

Questionnaire

Appendix II

Cost of Emergency Medical Technology Education
Technical Curriculum

To be completed by the Director of the Emergency Medical Technology Program.

Assigned Number ______________

1. In what year were students first admitted to the EMT-P Program? ____________

2. List the number of **Full-time FTE faculty and the Total Full-time FTE faculty contract salaries**, exclusive of institution's required contribution to the state employee retirement option and other fringe benefits for the following academic years.

Academic Year	Number of Full-Time FTE Faculty	Total Salaries Full-Time FTE Faculty
1989-90		
1990-91		
1991-92		

3. List the number of **Part-time FTE faculty and the Total Part-time FTE faculty contract salaries**, exclusive of institution's required contribution to the state employee retirement option and other fringe benefits for the following academic years.

Academic Year	Number of Part-Time FTE Faculty	Total Salaries Part-Time FTE Faculty
1989-90		
1990-91		
1991-92		

4. Does your institution calculate fringe benefits as a percentage of full time faculty member's salary?

   No ______ Yes______ Percentage of FT Faculty Salary ______%

5. Does your institution calculate fringe benefits as a percentage of part time faculty member's salary?

   No ______ Yes______ Percentage of PT Faculty Salary ______%

Questionnaire

Cost of Emergency Medical Technology Education
Technical Curriculum

6. Please list the expense for the following categories:

			Academic Year	
Category	Initial Yr.	1989-90	1990-91	1991-92
Support Staff	______	______	______	______
Communication (telephone, mail, etc.)	______	______	______	______
Travel	______	______	______	______
Instructional Supplies	______	______	______	______
Equipment	______	______	______	______

7. The number of clinical sites (both hospital and field) used by this program for clinical experiences were: (if no charge for the use of clinical or field facilities, place N/A in the column).

	Initial Yr.	**1989-90**	**1990-91**	**1991-92**
No. of Hospital Clinical Sites				
Total Charges for Clinical Site Usage				
No. of Field Clinical Sites				
Total Charges for Field Clinical Sites				

8. For each clinical experience, the required student contact hours and the average preceptor/student ratio were as follows:

			Academic Year	
	Initial Yr.	1989-90	1990-91	1991-92
Emergency Department				
Contact Hours	______	______	______	______
Preceptor/student ratio	______	______	______	______
Anesthesia/Surgery				
Contact Hours	______	______	______	______
Preceptor/student ratio	______	______	______	______
Coronary Intensive Care Unit				
Contact Hours	______	______	______	______
Preceptor/student ratio	______	______	______	______

Questionnaire
Cost of Emergency Medical Technology Education
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			Academic Year	
	Initial Yr.	1989-90	1990-91	1991-92
Obstetric Labor & Delivery				
Contact Hours				
Preceptor/student ratio				
Pediatric Unit				
Contact Hours				
Preceptor/student ratio				
Surgical Intensive Care Unit				
Contact Hours				
Preceptor/student ratio				
Psychiatric Unit				
Contact Hours				
Preceptor/student ratio				
Phlebotomy Team				
Contact Hours				
Preceptor/student ratio				
ALS Mobile Unit				
Contact Hours				
Preceptor/student ratio				

9. Record the number of hours of classroom and laboratory instruction. List the **faculty:student ratio** for each form of instruction in the technical curriculum.

Academic Year	Hours of Classroom Instruction	Student:Faculty Ratio	Hours of On-Campus Laboratory Instruction	Student:Faculty Ratio
Initial Year				
1989-90				
1990-91				
1991-92				

Questionnaire

Cost of Emergency Medical Technology Education
Technical Curriculum

10. List the **average hourly salary** for part-time instructional staff for the following years:

			Academic Year	
	Initial Year	1989-90	1990-91	1991-92
Average hourly salary	______	______	______	______

11. Student enrollment and graduation for the technical curriculum were as follows:

			Academic Year	
	Initial Year	1989-90	1990-91	1991-92
Admitted	______	______	______	______
Graduated	______	______	______	______

Thank you for your time and the information you have provided.

Appendix III

February 16, 1993

Mr. William E. Brown, Jr., R.N., M.S., NREMT-P
Executive Director
National Registry of Emergency Medical Technicians
P.O. Box 29233
Columbus, Ohio 43229

Dear Mr. Brown:

Currently I am a doctoral candidate in the College of Education at the University of Toledo majoring in higher education administration. The research proposal I plan to pursue is an analysis of the departmental cost of the technical curriculum program costs of associate degree emergency medical technician-paramedic education programs accredited by CAHEA in two year public community or technical colleges in the United States. The programs selected for the study are located in states that require successful completion of the National Registry Advanced Level examination for certification EMT-P. The analysis of the cost component is for the initial year of the program and for the academic years 1989-90,1990-91, and 1991-92.

The survey questionnaire is based on a model used to analyze the costs of other allied health education programs. The population for this study will be twelve associate degree emergency medical technology programs housed in public two year community colleges in the United States, graduating students in the 1991-1992 academic year. The programs were selected based on two criteria; they are, that the programs are (a) accredited by the Committee on Allied Health Education and Accreditation (CAHEA), and (b) are located in states that require successful completion of the National Registry of Emergency Medical Technicians-Advanced level examination as a prerequisite for state certification.

This study will describe the expenditures for the start-up of an initial program as reported by program directors. The study will also describe the total program expenditure for the academic years 1989-90, 1990-91 and 1991-92 as reported by the program directors. This study will describe the relationship between the (a) instructional contact hours including the number of student contact hours in the technical curriculum, in the technical lectures, in the technical laboratories and in the directed clinical and field internship experiences, and the (b) program characteristics such as total student enrollment, number of faculty, faculty compensation, length of time the program has been in operation, attrition rates, pass rate on National Registry of Emergency Medical Technicians paramedic level certification examinations.

I am requesting the National Registry of Emergency Medical Technicians-Advanced level examination results for individual programs (see attached list) each year for which budget information is collected. The results requested are:

1. scores of all graduates on the written segment for each program
2. percentage of graduates who pass the written segment for each program
3. percentage of graduates who pass the practical segment for each program

No program in the final analysis will be able to be identified other than through the code number known to the program and the researcher. Complete confidentiality will be assured. You are free to choose to participate or not participate, and you may stop your participation at any time. By supplying the requested information you are giving your consent to participate in the project. This study conforms to the requirements of The University of Toledo Committee on Human Subjects Research.

As you are undoubtedly aware, no research studies have been done by the profession in the area of emergency medical technology curriculum costs; therefore I would appreciate the cooperation of the National Registry of EMTs in providing me with the requested NREMTA Advanced level examination results.

Sincerely yours,

Judith A. Ruple, R.N., M.Ed.
Assistant Professor
Director, Emergency Medical Technology Program
The University of Toledo
Toledo, OH 43606
Phone: (419) 537-3195 or (419) 865-5953

Appendix IV

May 10, 1993

1 ~

Dear 2 ~ :

Thank you for taking time to talk to me several weeks ago regarding my research project. Currently, I am a doctoral candidate in the College of Education at the University of Toledo majoring in higher education administration. The research proposal I am pursuing is an analysis of the technical curriculum program costs of emergency medical technician-paramedic education programs accredited by CAHEA in two year colleges in the United States. This information should be useful for program directors when preparing budget requests and justifications. The programs selected for the study have similar characteristics, so the findings will be pertinent to your situation.

The programs selected for the study are located in states that require successful completion of the National Registry Advanced Level examination for certification as an EMT-P. The cost component is for the initial year of the program and for the academic years 1989-90, 1990-91, and 1991-1992.

You are invited to participate in this research project. To participate you will only need to fill out the attached questionnaire. There will be complete privacy of the information you supply. You are free to choose to participate or not participate, and you may stop your participation at any time. By completing this questionnaire, you are giving your consent to participate in the project.

I have enclosed a questionnaire for your use. I realize the tremendous workload program directors face at this time of year. If I could be of any assistance to you in the preparation of the questionnaire by phone, I would be more than willing to arrange to do so. Programs are identified by a code number known to you and the researcher. Complete confidentiality is assured.

The findings of the study will be forwarded to you for your use in program planning. Thank you for your time and assistance. I do appreciate your contribution and cooperation. Best wishes for a pleasant spring season.

Sincerely yours,

Judith A. Ruple, R.N., M.Ed.
Assistant Professor
Director, Emergency Medical Technology Program
The University of Toledo
Toledo, OH 43606
Phone: (419) 537-3195 or (419) 865-5953

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